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LISTER'S CENTENARY*

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THIS is Lister's centenary. The name of Joseph Lister will ever be revered and remembered wherever surgery is taught as a science and practiced as an art. Probably there was never such an assemblage of learned and scientific men as was welcomed by King George in London on April 5 at the celebration of the centenary of the birth of Joseph Lister. In the hall of the British Medical Association numerous eulogistic addresses were delivered and in Westminster Abbey memorial services were held by the Bishop of Birmingham—certainly no such grand and glorious tribute was ever paid to the memory of any of England's "immortal dead who live again in minds made better by their presence."

Like that other miracle, William Shakespeare, Lister was born in a small village in the midst of the common people, at Upton in Essex County, thirty-four years after the death of the great Scotchman, John Hunter, who dominated the surgery of the eighteenth century as did Lister that of the nineteenth. The brains of these two men were the mighty looms that wove the indestructible fabric of England's surgical greatness—John Hunter the greatest surgeon up to Lister's time—Lister the greatest of all time.

Lister's father and grandfather were wine merchants in London. The father, Joseph Jackson Lister, was of an eminently scientific turn of mind. He perfected the compound microscope; and "Lister's Law of the aplanatic foci remains the guiding principle as the pillar and source of all the microscopy of the age." In connection with Thomas Hodgkin, in 1827, the year of the birth of his son, Joseph, he determined the diameter of the red blood corpuscles and their rouleaux-formation. Lister's mother was Isabella Harris, a brilliant woman, and a teacher of elocution.

Joseph Lister attended private schools, at the age of seventeen entered the University College, London, was graduated A.B. in 1847, and five years later qualified in medicine. Lister was stricken with smallpox and was unable to commence his medical studies until 1848. He was, however, more fortunate than the brilliant Henry Gray, author of Gray's Anatomy, who was born the same year as Lister but died of smallpox at the early age of thirty-two. Lister, upon graduation at the University College, entered the University College Hospital and served for nine months as Erichsen's house-surgeon.

The mistake of speaking of Sir John Erichsen as an Englishman is frequently made. He was born in Copenhagen, in 1818, and the old family home, Le Palais Erichsen, is one of the show places of the Danish capital. Erichsen, like Lister, started out as a physiologist, but soon turned to surgery, and at the age of thirty-two, upon the retirement of Mr. Syme from the University College, London, was made a

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full professor there. In those days they "tried them out" before election, and Erichsen was given a lithotomy with Thompson, afterwards the great Sir Henry Thompson, who lithotritized Napoleon III, in 1872, holding the staff. On account of his myopia Erichsen was never a great operator, but measured up as a diagnostician and wrote the very Bible of surgery

Sir John Eric Erichsen.

in 1853. During our Civil War the U. S. Government had a special edition published and gave a copy to every surgeon in the Federal Army. On September 23, 1896, on the death of Sir John Eric Erichsen from angina pectoris, the profession lost one of the ablest literary exponents of the science of surgery of the generation.

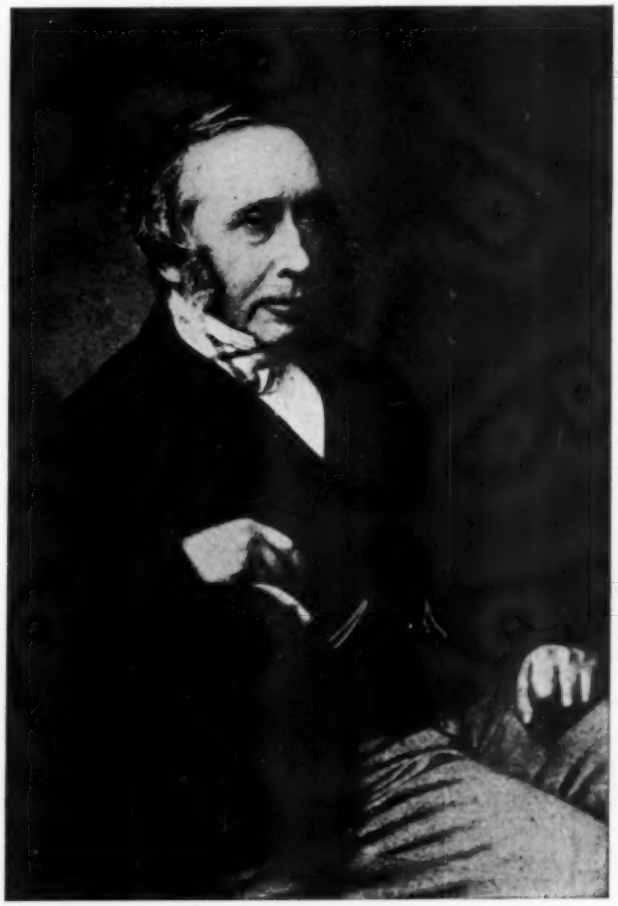
Saturated with scientific heredity and a student and admirer of the physiologist, Sharpey, it is not surprising that the spirit of investigation and experimentation was early infused into Lister's mind and that his first paper, the year of his graduation, was upon the identity of the muscle of the iris and involuntary muscular fiber. Having served his time in London, upon the advice of his former teacher and friend, Sharpey, he went to Edinburgh "to take six weeks of Syme's clinic" but remained six years and married Mr. Syme's daughter, Miss Agnes Syme.

When Mr. Syme was nineteen years of age he had charge of Robert Liston's dissecting room, but a quarrel with the great master, who never hesitated to cut off with his amputating knife a piece of his operating table to plug a bleeding bone, kept him out of the Edinburgh Royal Infirmary for a number of years. In 1829 he commenced teaching surgery and opened a private infirmary, Minto House, with twenty-seven beds, which was everywhere recognized except at home, and in popularity soon rivaled the Royal Infirmary. It was here that he first divided the sterno-cleido-mastoid muscle for torticollis. In 1833 Syme agreed to pay Russell fifteen hundred dollars a year to resign the chair of Clinical Surgery at the University and was appointed to the vacancy by the Crown. About this time Liston and Fergusson went to London and left Syme without a surgical rival in Edinburgh. With Liston, Syme revived flap amputation, first proposed by Lowdham of Oxford, and shared with Fergusson the honor of reviving excision of joints and is alone entitled to the credit of originating, in 1842, the operation of amputation at the ankle-joint, which bears his name. He devised many mechanical instruments, performed external urethrotomy for the cure of callous or impassible strictures, and demonstrated the function of the periosteum in repair of bone. Upon the death of his great enemy and cousin, Liston, who, it has been said, once was overheard demonstrating to his class the similarity of Syme's head to that of the chimpanzee, Syme succeeded to the Chair of Surgery in the University College Hospital, of London, but returned to Edinburgh before the end of the year. Upon his return home he devoted much time to the treatment of aneurisms. He was first in modern times to incise, turn out the clot

and tie each end of the diseased vessel in the carotid, axillary and iliac. J. Marion Sims said, "I have seen, all over the world, great surgeons operate, in my own country, in London and in Paris; but I have never seen such an operator as Mr. Syme." Syme was polemical and a born controversialist, immensely popular with the students, but disliked by his colleagues. His great friend and student, Dr. John Brown, the author of "Rab and His Friends," a pathetic story that need not blush in company with Hannah More's "Shepherd of Salisbury Plain," said of him, "He was almost always right in matter, sometimes wrong in manner." Mr. Syme is the surgeon in the story. Early in life Syme, who had a decided taste for chemistry, discovered that distilled coal-tar is a ready solvent of caoutchouc, which led to the waterproofing of cloth, and this process was patented by Charles Mackintosh. We owe our raincoats to the genius of Mr. Syme. Mr. Syme died in Edinburgh, in 1870, after his third paralytic stroke, and was succeeded by Lister, who was at the time in Glasgow.

We learn from Sir Hector Cameron, who was Lister's house-surgeon at the Glasgow Royal Infirmary in 1861, that he had seen as many as five cases of amputation of the leg die of pyemia in that institution in one week. This made a profound impression upon Lister, who at the early age of thirty-four had just been called to the Chair of Surgery, and he immediately went to work to investigate the cause. He taught that "the cause of suppuration in wounds was the decomposition of blood and serum retained within them, brought about in some way through the influence of the atmosphere." Sir Watson Cheyne tells us that in 1864 Lister, when walking home with Prof. Thomas Anderson, who held the Chair of Chemistry in the University of Glasgow, had his attention called to certain papers on fermentation and spontaneous generation which had recently been published by the French chemist, Pasteur. Lister read these papers and found from Pasteur's experiments that it was minute living particles floating in the air or settling on surrounding objects in the form of dust, and not the gases of the air that the surgeon had to fear.

The problem that presented itself to the mind of Lister was how to destroy these microorganisms of the vegetable kingdom before and after operations, and if, as in compound fractures, they had already entered the wound, then how to destroy or inhibit their growth before they could get a foothold and spread. About this time Lister saw a newspaper article giving an account of carbolic acid, discovered by Runge in 1834, and its wonderful effect in cleansing the sewage of the town of Carlisle, and conceived the idea that carbolic acid might be used to kill the germs without detriment to the wound. Prof. Anderson



Professor James Syme.

secured a supply of a purer specimen of carbolic acid which would dissolve in water, one to twenty.

In 1863 Jules Lemaire, a French pharmaceutical chemist, wrote a book on carbolic acid in which he accepted the germ theory as the explanation of putrefaction and recommended the use of carbolic acid for dressing wounds and "for all sorts of diseases." The book attracted very little attention and the work of Lemaire was not heard of by Lister until 1867, several years after Lister had used carbolic acid, when an anonymous letter attacking Lister was published in the Edinburgh Daily Review and the profession was flooded with reprints. This false and libelous communication was traced to Sir James Y. Simpson, "a very religious man who preached every Sunday" (Gross).

All honor to the names of Oliver Wendell Holmes and the martyred Hungarian, Ignaz Philipp Semmelweis; but as Lister knew nothing of their work and was in no way influenced by them, a review of their achievements would not be germane.

In 1867 Lister struck his level and laid down upon an eternal and unshakable foundation the great principle of the modern treatment of wounds. In his address before the British Medical Association he stated that septic properties depended upon minute organisms, that suppuration might be avoided by using some agent capable of destroying them, and recommended carbolic acid. He called the microorganisms which produce suppuration "dust particles," and believed that air infection was the great source of danger. His carbolic spray was the outcome. He soon discovered that these microorganisms were omnipresent, that the greatest danger was actual contact infection, and he recommended cleansing of the surgeon's and assistant's hands, patient's body, instruments, threads, and dressings. He saturated a piece of lint with pure carbolic acid and mopped the wound out, afterward covering it with the same material and holding it in position with pieces of tin. The tin was daily removed and the dressings painted with pure acid. He treated abscesses by mixing pure carbolic acid with pus which formed a paste. He filled the wound with paste and covered it with tin. He next used as a dressing for all wounds antiseptic putty, made of carbolic acid, linseed oil, and carbonate of lime. The putty was found unwieldy and he used "antiseptic lac plaster," which is made by melting shellac and mixing it with carbolic acid. Its adhesiveness was highly objectionable, and he overcame it by painting the calico, saturated with shellac and carbolic acid, with "a solution of india rubber and benzine." The benzine was soon evaporated and the india rubber prevented the dressing from sticking. To prevent irritation from the acid he covered the line of incision with an oiled silk protective, which had previously been dipped in a solution of carbolic acid. We learn from Sir Hector Cameron that this was the dressing used by Lister when he returned to Edinburgh in 1869 as a successor to Mr. Syme. In the Lister number of the British Medical Journal Mr. Cheyne has an article in which he states that Lister in 1873 substituted carbolic gauze for lac plaster and introduced his spray. In 1890, when he discovered that the dust did not contain pathogenic microorganisms, he discarded the carbolic spray, washed the wound with a weak solution of bichloride of mercury, and substituted the double cyanide of mercury and zinc for the carbolic gauze. I heard Lister say in 1884 that he questioned the necessity of the spray but that his results had been so satisfactory that he was loath to make a change. I was impressed with his statement about the spray and in perfect agreement, as I couldn't figure out how to get the price of one of those big steam sprays out of my allowance. He used carbolic acid for disinfection of the skin and instruments. Just prior to his discovery, from 1864 to 1867, his mortality in major amputations was 50 per cent. From 1867 to 1869 his

mortality in the same class of cases was 15 per cent. In the face of these decisive and incontrovertible statistics Spence, Billroth, and other leading surgeons ignored his teaching and continued to empty their wards with a death-rate four times greater than his. Professor Ogston, of Edinburgh, first accepted it in its entirety, and he was soon afterward followed by Macewen, of Glasgow. A German, Von Bergmann, in 1886, was the first to use steam sterilization for instruments and dressings.

A son of a member of the Society of Friends, Lister was the antipode of his twin brother in science, the polemical, pugnacious, and unpeaceful Pasteur, who after the Franco-Prussian War in 1871 wrote to the Head of the Faculty of Medicine of the University of Bonn, "Efface my name from the archives of your Faculty and take back that diploma, the sight of that parchment is odious to me." When taunted and told at the British Medical Association at Plymouth in 1871 that "as his solutions become weaker and weaker his faith appeared to grow stronger and stronger" Lister did not swerve nor turn but intrepidly walked the highway of the right. His critics said the smell of carbolic acid would preclude its use; but in 1871 he was called by Sir William Jenner to operate upon Queen Victoria for a large abscess that had formed between the armpit and mamma, and he used carbolic acid. Her Majesty answered the criticism. Queen Victoria was the first patient upon whom Lister used a rubber drainage tube, though Chassaignac had used it in 1859. Lister cut the tube from a Richardson's atomizer that he had used the day previously to freeze the parts, and soaked it in carbolic acid. Sir Hector Cameron tells us that Lister was immensely pleased when King Edward VII said, "Lord Lister, I know well that if it had not been for you and your work I would not have been here today." The King referred to his operation for gangrenous appendicitis performed by Sir Frederick Treves which was made possible by Lister, and at which he was present.

The immortal Master lived

To see his own work out
And watch the sandy footprints harden into stone.

Lister's active work as a surgeon ended in 1892 when he reached the age limit and retired from King's College Hospital. We have it upon the high authority of Sir St. Clair Thomson that Lister with a purely altruistic motive left the Royal Infirmary at Edinbrugh, in 1877, where he had sixty to seventy beds, his lecture room crowded with enthusiastic, sympathetic and friendly students and foreigners, and went to King's College Hospital where only twenty-four beds would be allotted to him and his audiences would be cold, apathetic, and unfriendly, because London was the hotbed of his opposition and by going there he could sooner overcome the opposition, disseminate his great truths, and fulfil his mission in the world. Lowell has well said, "We breathe cheaply in the common air thoughts that great hearts once broke for." In 1895 Lister was elected President of the Royal Society and Mr. Cheyne says it gave him another five years of life.

In 1893 Mrs. Lister died under peculiarly distressing circumstances. She and her husband were botanizing in an out-of-the-way spot on the Italian Riviera when her death came after four days' illness of acute pneumonia. Lister was alone without a nurse or friend other than the local Italian doctor. He prepared the body for the difficult journey and distressing home-coming. She was truly his helpmate and after his death most of his papers were found in her handwriting. They had no children.

Never was there a more inspiring scene than on the celebration at the Sorbonne of Pasteur's seventieth birthday on December 27, 1892. With the band of the Republican Guard playing a triumphal march, Pasteur, worn and broken, leaning heavily upon the arm of the French President, Carnot, came upon the stage and fell into the

arms of Lister. This memorable meeting was portrayed upon canvas by the great artist, M. Rixens. It was like the meeting of Wellington and Blucher after Waterloo when the great Corsican commenced his melancholy march to St. Helena. It was the signal to the world that the surgery of the past, with its indescribable sufferings, miseries, misfortunes, and death was gone and forever, and that a new era, a golden age, of untold possibilities filled with hope, happiness and life for this and future generations had loomed. It was man's redemption of man. It was science in benediction with outstretched hands.

In 1875, though Lister's "turret torch was blazing high," like Leander, the surgeons in America would not see and could not hear. We find Dr. Samuel D. Gross, the Nestor of American Surgery, and Dr. Lewis A. Sayre, hard by, pushing a trocar through the ninth intercostal space of Vice-President Breckinridge at Lexington, Ky., to drain an abscess of the liver that was discharging a pint of pus daily through the lung. Dr. Gross complacently remarked that he made no reply to criticism, "conscious that we had done our duty."

As paradoxical as it may appear, mistakes are often a boom for the relief of suffering humanity. Perhaps some such case as Breckinridge's may have suggested to Sir Frederick Treves to go into an hepatic abscess and drain it with a tube an inch in diameter. When McGill, the father of prostatectomy, was told by his house-surgeon, Moynihan, that the microscope showed that a "tumor he had removed at the base of the bladder" was prostatic he answered, "Then why don't we always take the prostate out when it projects into the bladder?" When Sir Spencer Wells by mistake operated for an ovarian cyst and found tuberculous ascites he established the surgical treatment for peritoneal tuberculosis; and when he operated for a supposed uterine fibroid on an eighteen-year-old jaundiced girl, and removed an enlarged spleen he cured a lifelong jaundice, and inaugurated a surgical treatment of hemolytic jaundice (Moynihan). When Lister in an old dislocation at the shoulder-joint tore the axillary artery it was a warning against the use of too great force and a brief for the open operation.

In 1877 Dr. John T. Hodgen, the ablest and most progressive surgeon in St. Louis, said to Bernays, "I have performed sixteen laparotomies and have fifteen tombstones to show for them." It would have exhausted the imagination of a Dumas to have predicted that Dr. Hodgen's assistant, Dr. W. W. Mayo, upon the pedestal of whose statue in a Rochester park is the appropriate line of Wordsworth, "A man of hope and forward looking mind," would have founded the Mayo Clinic and that his sons, those wonderful surgeons, Drs. W. J. and C. H. Mayo, who have "eyes that feel and fingers that see," would have reported, in 1925, 8147 laparotomies with a total death of 2.7 per cent. Lister made it possible.

In 1879 I saw a distinguished New York Surgeon, Dr. Alexander B. Mott, resect a hip-joint on the same table upon which Dr. J. D. Bryant had just made an anatomical demonstration. He had the courageous impudence to tell us of the insulting language that he had used in 1876 to that man of invincible patience and radiant purity, who had laid the benign hand of healing on the wounds of humanity—Joseph Lister—and we the idiocy to applaud.

In a recent letter from the venerable W. W. Keen he said, "I was Lister's first pupil in Philadelphia, on August 1, 1876, in St. Mary's Hospital, gathering all the utensils, including steam spray, to carry out exactly his methods."

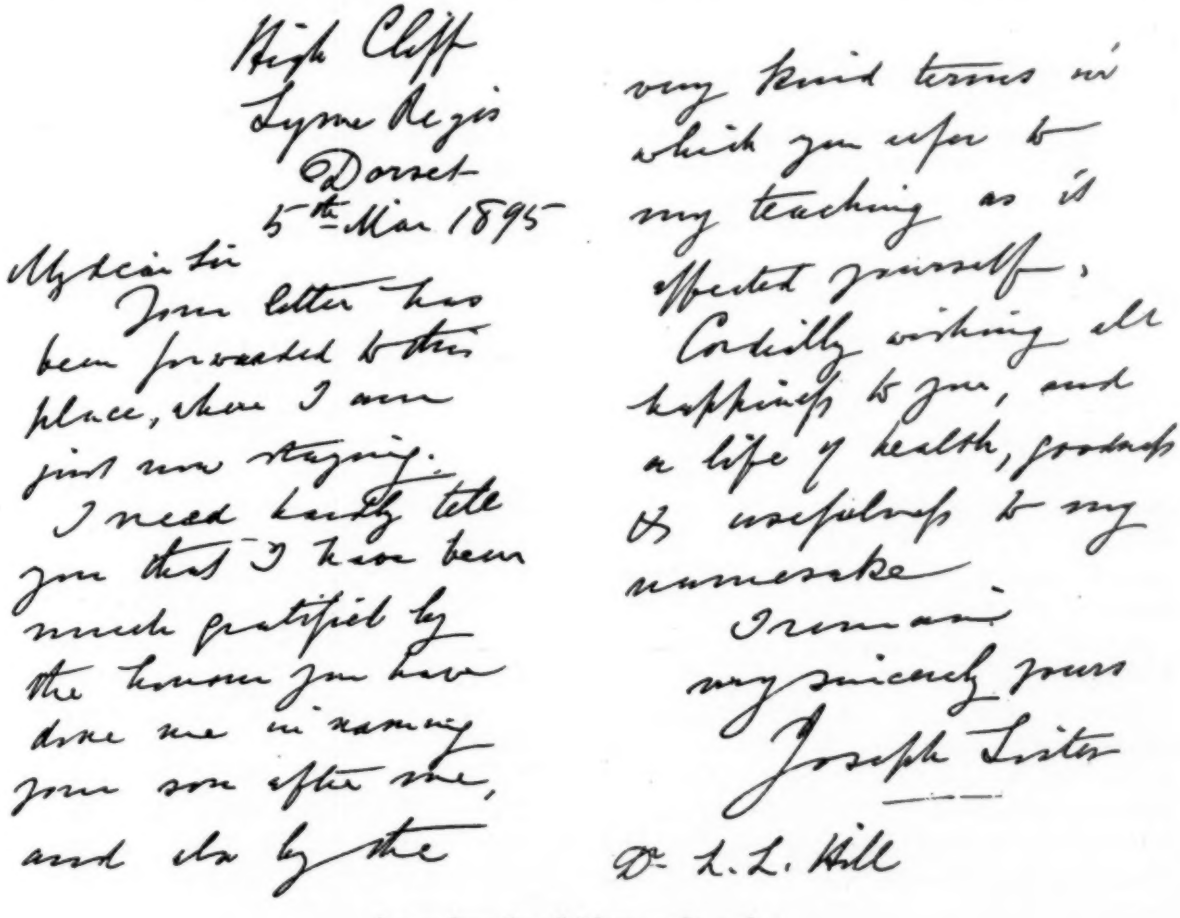
Sir St. Clair Thomson in the commencement of his scholarly address, "A House-Surgeon's Memories of Joseph Lister," quotes the lines written by Robert Browning when he met a friend who had known Shelley:

And did you once see Shelley plain
And did he stop and speak to you
And did you speak to him again?
How strange it seems and new.

Thomson said these lines convinced him that it was the duty of those who had the great privilege of "seeing Lister plain" to recall their personal recollections.

Joseph Lister weighed approximately 185 pounds and was six feet in height. He wore side whiskers and his hair, an iron gray, was rather long. His dress was always the same, a black Prince Albert coat and dark gray trousers, a standing collar and black cravat —"the apparel oft proclaims the man." He was modest, unobtrusive, and cared not for fame or fortune, but like Robert Burns clung to the common, everyday facts of life. When honors were thrust upon him they were received with a personal detachment, as his gratification and satisfaction were purely because he felt that his great work for the relief of suffering humanity was progressing, that his teachings were being more and more recognized and accepted. His sympathies touched the extremes of life and were as wide as want. In the serene simplicity of his great, generous, and sympathetic soul there was no station, caste, nor prerogative, and the "poor man was as rich as the richest and the rich man was as poor as the poorest—Dives relinquished his riches and Lazarus his rags." Possibly the greatest shock of Lister's life came to him when he, after reprimanding a Sairey Gamp, a type of nurse immortalized by Charles Dickens, asked her if she never thought of her responsibility for all the poor sufferers under her charge and she nonchalantly replied, "Oh, I nae minds o' them."

It has been well said that "things small


High Cliff
Lyme Regis
Dorset
5th Mar 1895

My dear sir
Your letter has been forwarded to this place, where I am just now staying.
I need hardly tell you that I have been much gratified by the honour you have done me in naming your son after me, and also by the very kind terms in which you refer to my teaching as it affected yourself.
Cordially wishing all happiness to you, and a life of health, goodness & usefulness to my namesake
I remain
my sincerely yours
Joseph Lister

Dr L. L. Hill

Letter from Joseph Lister to the author.

within themselves oft have far-reaching significance." I received this letter from him when I named my son, Congressman Joseph Lister Hill, for him:

High Cliff
Lyme Regis
Dorset
5th March, 1895.

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Cordially wishing all happiness to you, and a life of health, goodness and usefulness to my namesake,

I remain,
Very sincerely yours,
Joseph Lister.

Dr. L. L. Hill.

This letter was characteristic of the great man. He did not wish fame, fortune, or exalted position, but simply "a life of health, goodness and usefulness to my namesake." It told the whole story.

Sir St. Clair Thomson was Lister's house-surgeon when I was there and it was evident that he had the approbation and confidence of his Chief. He was to Lister in his hostile surroundings at King's College Hospital what Archie Butt was to Roosevelt. The nursing was done by the Sisters of St. John, an Anglican Community, who thought surgeons operating was by their sufferance, that Lister's daily visits to the hospital were unwarranted interferences, his Sunday visits sacrilegious; who thought more of the esthetic than surgical dirt, believed more in prayer without operations than operations without prayer, did everything in their power to stifle and obstruct the efficient carrying-out of the details of Lister's treatment and in a general way "with devotions' visage and pious actions sugared over the devil himself." Sir St. Clair Thomson knew how to act promptly and do things—"carry a message to Garcia." He is the author of one of the best textbooks that has ever been written on the diseases of the nose and throat, and is the Chevalier Jackson of England. It is no wonder that he has been knighted.

Having finished my studies in New York and Philadelphia, I had a great desire to visit London and see Mr. Lister, with whose work I was familiar and whose great name was then claimed by England, but has since become a common heritage. In September, 1883, after a tempestuous voyage of fourteen days in which "Fright" did not cure "the qualms of all the luckless landsmen seasick maws" I reached Liverpool. On arriving in London I matriculated at King's College and through the courtesy and kindness of Dr. John Curnow, Dean of the Medical Faculty of King's College, I was given every opportunity to attend the Surgical Hospital Practice and Surgical Clinical Lectures at King's College Hospital. King's College Hospital, which has since been moved to Camberwell, had a capacity of three hundred beds, was devoid of grounds, and was located in a thickly settled neighborhood very near the Hunterian Museum, which cost John Hunter, called the Dick Whittington of British Surgery, over $375,000 and which since 1800 has been owned by the Royal College of Surgeons.

As I passed up the magnificent stairway and entered the operating room to hear Lister's opening lecture my eyes soon rested upon the bas-relief of Sir William Fergusson, whom Lister succeeded in 1877. I thought of his thirty-four years of active service in the hospital and of his lamentable death, of Bright's disease. I could see the great Scotchman, the most marvelous operator of his time, remove the upper jaw, lithotomize, perform his wonderful plastic work, and divide the levator palati and palatopharyngeus muscles as a preliminary to his successful staphylorrhaphy. His wonderful delicacy of touch enabled him to become a great violinist. Like Billroth, Mikulicz, and Rokitansky, he was a lover of all music, a worshipper

of Wagner, Beethoven, and Liszt, "of every eagle that soars in the heaven of sound." Fergusson was an uninteresting lecturer, not well informed about the works of others, and his ideas of pathology were archaic. On one occasion, while lecturing upon caries and necrosis, a student reminded him that his views differed from those of Niemeyer. Fergusson replied: "Sir, Nehemiah was a gentleman who wrote one of the books in the Old Testament, but I have yet to learn that he had views on caries and necrosis."

I thought of Sir Thomas Watson, "The Cicero of English Medical Literature," having once been a teacher here and how he electrified his classes.

Richard Partridge had previously been a surgeon of great distinction at King's College Hospital. He was one of the surgeons who went to Italy to examine Garibaldi's ankle after he was shot at the battle of Aspromonte in 1862. Partridge, unable to locate the bullet, said that none existed. But Garibaldi was not satisfied with the English surgeon's opinion and sent to Paris for Nélaton. Before starting to Italy Nélaton consulted an eminent French chemist to ascertain whether it were possible to devise an instrument which when rubbed against lead would receive the stain of the metal. The result was the famous porcelain probe, a metallic rod tipped with porcelain, which all of us had in our pocket cases before the roentgen ray. With this Nélaton located the bullet, enlarged the sinus, removed it, and this was followed by a cure with permanent ankylosis. Nélaton made a great reputation, and Partridge never recovered from his mistake.

Mr. John Wood was a clinical professor of surgery at King's College Hospital when I was there. He was a powerfully built man with a distinct lameness, and a harsh and abrupt manner. He was a thorough anatomist, having once taught it, and I thought a very good operator. He had written a book on hernia and frequently did his subcutaneous wire operation for the radical cure of inguinal hernia, the success of which depended upon getting firm union of the conjoined tendon of the internal oblique and transversalis muscles with the deep part of Poupart's ligament. The operation seemed to me blind and brutal, and could easily have been bloody where a lesser anatomist than Mr. Wood stuck the big needle into the iliac artery. Wood claimed that "Lister's fame came from Germany, that the Germans were dirty people, but that the antiseptic system was not really necessary in England." Mr. Wood wrote the article on hernia for Ashurst's "International Encyclopedia of Surgery." Mr. Wood's assistant was Mr. William Rose, who was always flashily dressed, and I thought had many of the elements of an English dude—the direct opposite of his Chief. It never occurred to me that Mr. Rose would be the first to remove the Gasserian ganglion or write a standard textbook on surgery.

When Mr. Lister appeared in the operating room he was accompanied by his assistant, Mr. Watson Cheyne, now a member of Parliament, whom he brought from Edinburgh in 1877, when he came as the successor of Sir William Fergusson. "Lions make leopards tame." In the august presence of this great man who "had divided the history of surgery into two great eras, before Lister and after Lister," I was awed into a feeling of what Benjamin Rush described as suffocated excitement. Lister was then practically in the meridian splendor of a fully developed and glorious manhood. Unlike our American professors, he took a seat. He commenced lecturing upon the aseptic and antiseptic treatment of wounds, the chart and compass of all surgical advancement. It occurred to me that I had never seen so thoughtful a face, a more kindly expression, nor a more benignant smile to mirror a great inward soul. He spoke in a conversational tone with an almost imperceptible stammer that added to the charm of his musical voice, and he had a lucidity of statement unequaled by even Mr. Erich-

sen. As an operator he was resourceful, cleanly, bold, courageous, self-possessed, but not given to rashness. He wore no operating overalls and had no rubber gloves, but his work was the signboard upon the great surgical highway that pointed to the perfection of today. He taught us avoidance of irritation by anti-

Central portion of the picture by M. Rixens representing the ceremony at the Sorbonne, December 27, 1892. Lister and Pasteur.

sepsis, for which he used oil silk protective, and the destruction with carbolic acid of the microorganisms before they reached the wound. I saw him refuse to amputate in a compound dislocation of the ankle-joint with extensive laceration, and in a compound, comminuted fracture of the leg. I remembered what the elder Gross had taught me, and I thought of what Syme had said, and yet I saw him save both limbs. I saw him operate for knock-knee, malunited and ununited fractures, wire the patella and olecranon, excise the wrist for caries, perform an open operation for radical cure of hernia, resect the knee-joint, do a suprapubic lithotomy, and almost do a Halsted in a mammary carcinoma. In 1867 Lister performed the first of his radical breast operations upon his sister after she had been told by the most eminent London surgeons that an operation on account of the dangers of infection was absolutely unjustifiable. Lister believed that with the use of antiseptics the undertaking was warranted and having the courage of his convictions removed the breast and contents of the axilla with a part of the pectoralis major muscle. She recovered and lived for many years. Lister's heroism parallels that of our Halsted, who with his own hand, in 1881, turned the current of his own blood into a vein of an exsanguinated and apparently dying sister, and saved her. A year later he hurried to Albany, New York and at two o'clock in the morning operated upon his mother for empyema of the gall-bladder that was about to rupture, and relieved her. It all seems easy today for, as Alfred Tennyson has beautifully expressed it,

> Most can raise the flowers now
> For all have got the seed.

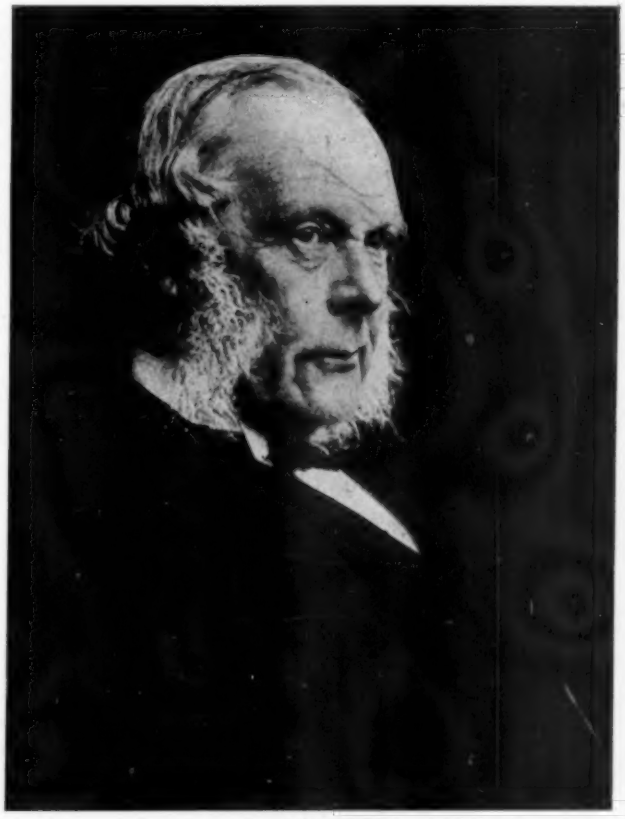
I saw Lister use no other anesthetic than chloroform, by the open method, discovered in 1847 by one of his colleagues and one of his most unrelenting and unfair critics, Sir James Y. Simpson, who said, in 1871, "The man laid on the operating table in one of our surgical hospitals is exposed to more chances of death than the English soldier on the field of Waterloo" (Thomson). It was an American surgeon, Crawford W. Long, that five years before Simpson

> Struck from the roll of pangs one awful sum
> Made pain a dream and suffering gently dumb.

Lister used silver wire alone for suturing, for which he gave Sims credit, with a specially constructed needle. The eye of the needle was some distance from the end, and beyond the eye were grooves in which the wire fit snugly. He manifested the greatest admiration for his illustrious father-in-law, frequently during his lectures quoted Mr. Syme, and would sometimes exhibit pathological specimens that had been collected by the great surgeon. His article on amputation in Holmes's "System of Surgery" is a classic, and Lister's method of bloodless operating antedates Esmarch's bandage.

I had the honor of being one of the students that cheered him in 1883 when he returned from Windsor Castle with a baronetcy, and I rejoiced when he became a peer in 1897. Lister's pioneer work in practical surgery, which entitled him to everlasting fame, has been completely overshadowed by the enormous benefit to suffering humanity brought about by his revolution in the treatment of wounds. Lister's greatest characteristic was his conscientiousness. He refused to allow Mr. Cheyne to publish the notes of his clinic because surgeons, who did not believe in antiseptic treatment or who did not understand the technique, without the protection of which there would be loss of life or limb, would attempt to perform his new operations and to carry out his new line of treatment.

The other day at the celebration of Lister's Centenary in London Sir Berkeley Moynihan said in his masterly address: "Though Lister's earliest efforts were concerned with the abatement of existing decomposition of wound discharges, it was not long before the problem of the prevention of infection became paramount. It is beyond dispute that Lister clearly realized the distinction between the "prophylactic" and the "therapeutic" uses of chemical agents in surgery. We know now that the old quarrel as to the relative merits of the "antiseptic" and the "aseptic" methods was senseless and jejune; for Lister was indubitably the parent of both; if indeed, there are really two methods. No surgeon ever practiced with success a method in which agents for the destruction of organisms were omitted. Aseptic surgery is the wise practice of antiseptic surgery. There is a difference in detail, not in ideal, or in fundamental truth."



Lord Lister.

Never aggressive, never palestric nor unpeaceful, but always kind and always considerate, he would say to us, "Gentlemen, I commend these facts to your candid and impartial judgment, beseeching you to form your own opinions regarding them. You are as competent as you will be to draw logical inferences from established data." Lister was unfitted and unsuited by temperament, training, and early environment for controversy; and, unlike Socrates, had no Xenophon, or to be more explicit, had no "bull dog," as Darwin had in Huxley, to attend to the needs of Spence, Simpson, and Savory. During the six

months that I saw him almost daily there was never a word nor act to cast a shadow upon his cherished memory.

By his great generalizations he has placed every organ in the body under the domain of surgical sway, made possible the wonderful clinics of the Mayos, Murphy, Deaver, Ochsner, Robert Jones, Moynihan, and others. Lord Lister relegated diseases like hospital gangrene to the past, and to victims, "oft in the morn and liquid dew of youth," listlessly looking a last good-bye to their loved ones he has given a chance, and glorified surgery. He has made civilized man his debtor, brought joy and gladness alike to the hovel of the poor and to the palace of the rich, to the Coburg of Windsor Castle and to the degraded occupant of White Chapel.

Sir Berkeley Moynihan in his Boswellian Oration, "John B. Murphy—Surgeon," referring to Lister, said, "If a man's services to humanity are the standard by which we measure his value then Lister may be counted as perhaps the greatest man the world has ever produced. He has been the means of saving more lives than all the wars of all the ages have thrown away." Who is better equipped or more competent to pass judgment upon the achievements of Joseph Lister than Berkeley Moynihan?

Sir St. Clair Thomson said, "Lister has wrought more for the relief of suffering, for the security of life, for the prevention of anxiety and for the promotion of happiness than any one man who has ever trod this earth."

Our distinguished ambassador, Thomas F. Bayard, addressing Lister at a banquet, said, "My lord, it is not a profession, it is not a nation, it is Humanity itself which with uncovered head salutes you."

Drawn and withering, for three years practically deaf and blind, Lister sat in the twilight of a life of fulfilment, "waiting for the night, waiting for the light," when on the morning of the 10th of February, 1912, at Walmer, the curtain fell upon the world's greatest tragedy, save when there came from those pallid lips, that had never uttered any but the purest and sublimest thoughts, that heart-rending cry as they were molding on the inertia of death, "My God, My God, why has Thou forsaken me?"

When Baron Lister "left the shore touched by the mysterious sea that never yet has borne on any wave the image of a homeward sail," the great surrogate of truth and justice decreed as his legacy to his profession the magnificent achievements of the present and the marvelous possibilites of the future.

By his request he was buried with his wife at West Hampstead, although the services, with representatives from every civilized nation of the world present, were held at Westminster Abbey, where death is associated with public veneration and imperishable renown, and where the choir, as over John Hunter, proclaimed Handel's Funeral Anthem. As Sir Rickman Godlee said, "the words of the anthem, though a strange blending of texts from the Old and the New Testaments, were peculiarly applicable":

> When the ear heard him, then it blessed him, and when the eye saw him it gave witness of him: he delivered the poor that cried, the fatherless, and him that had none to help him. Kindness, meekness and comfort were in his tongue. If there was any virtue, and if there was any praise, he thought on those things. His body is buried in peace, but his name liveth evermore.

In closing this altogether inadequate sketch of my venerated master I am tempted to paraphrase a beautiful apostrophe by that charming personality, "sculptor in speech, and colorist in words," Ernest Renan: "Repose in glory, noble founder, thy work is finished, the most complete immortality established. There will travel the royal road which thou hast traced ages and ages of followers."

There never was but one Joseph Lister; there never will be another.

GASTRIC SARCOMATA

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HAVING had not long since the opportunity of operating by excision a case of authentic sarcoma of the stomach (histologically demonstrated), a few reflections on this somewhat uncommon gastric neoplasm may not be devoid of interest.

The writer will take at random three books by an American, an English and a French author, written respectively in 1913, 1916 and 1926. The first of these, George Roe Lockwood, professor in Columbia University, New York, says," Sarcoma of the stomach is comparatively infrequent, probably not exceeding 1 per cent of gastric tumors." He then goes on to give statistics from German Universities, as usual without an intrinsic value,[1] but referring to Fenwick's estimate, Lockwood thinks that it is too high, "for in 1910 only 123 cases were reported and Gossett (meaning Gosset) has been able to collect but 171 cases of gastric sarcoma."

Now, in 1926, otherwise thirteen years. later, Lecéne and Leriche[2], say (my translation): "They [sarcomata] are rare tumors when compared with gastric epitheliomata: There at present exists more than 200 instances of gastric sarcoma. It is probable that among these, there are a certain number of neurofibromata of the stomach, with an exogastric evolution, representing large growths and pseudocysts with bloody contents; these tumors which much resemble sarcomata, are in reality frequently neurinomata far less malignant than round-cell sarcoma or lymphosarcoma; quite a number of these [the patients] have remained perfectly well after resection of the stomach (Gosset) when more or less extensive. On the contrary, true sarcomata infiltrate the gastric walls quite completely and give rise to soft tumors or pseudocysts of large size extremely serious, and only a few cases of permanent cure have been recorded. However, Ruppert has published a case of lymphosarcoma of the stomach which was seen cured at the completion of fourteen years after total gastrectomy."

H. Norman Barnett[1] says: "This [sarcoma of the stomach] is not common, and when present the variety is usually spindle-celled or lymphosarcoma. The signs of the condition are very similar to those of carcinoma. Gastric dilatation, however, is not so marked, and the tumor is usually larger and may be palpated with greater ease. It occasionally happens that the spindle-celled variety grows as a polypus and can be removed locally."

Sarcoma of the stomach presents itself under several very different anatomical aspects, and, as I should attempt to show, will for this very reason set up quite desperate symptoms according to the given case. According to their seat or their size, these sarcomatous productions make themselves manifest by junctional disturbances which will incline the practitioner to a diagnosis of chronic gastritis, pyloric stenosis or ulcer or cancer of the stomach. It likewise may happen that these neoplasms give rise to no gastric symptoms and while some—on account of their small size—will be passed clinically unnoticed, others of relatively large dimen-

[1] For example, Lockwood quotes Tilger who found 1 case out of 3500 autopsies; out of 13,387 autopsies Hosch encountered 6 cases. Wilde and Gurlt, out of a total of 1263 necropsies on sarcomatous patients, compiled from the records of Munich and Berlin did not find a single case of gastric sarcoma. Such findings only distort the question and are not to be considered.

[2] Lecène, P., and Leriche, R. Therapeutique Chirugicale. Paris, 1926, Vol. iii.

[1] Barnett, H. N. Student's Text-Book of Surgery. London, 1916.

sions—reaching the size of an adult head—reveal themselves in the form of an abdominal tumor which may readily be mistaken for a neoplasm of the omentum, spleen or even an ovarian cyst. Yet whatever may be the nature and origin of these neoplasms, it will only be after their clinical manifestations that the surgeon will be called upon to decide upon the opportunity of an operation. What is important for him to know is not the nature of the tumor—impossible to determine clinically—but its location and size which govern the symptomatology. For this reason it would appear that the following classification of gastric sarcomata may be fruitful:

1. Sarcomata developing toward the gastric cavity.
2. Infiltrating sarcomata.
3. Exogastric sarcomata.

Although this classification may, in some ways, be defective, it is the clearest one, as well as the most useful for the practitioner. Sarcomatous growths developing toward the gastric cavity or infiltrating the walls of the stomach may closely resemble epithelial neoplasms. Yet there exists a pathological variety, although unquestionably very rare, of gastric cancer, that of nodular growths disseminated throughout the walls of the stomach, which shall be referred to later. As to large growths, sometimes pedunculated, projecting into the abdominal cavity (extragastric development) they are absolutely special manifestations of this neoplastic process.

Sarcoma Developing into the Gastric Cavity. These growths project into the lumen of the stomach and are rare when compared with the relative frequency of the two other forms. Of 70 instances collected by Bertrand, 4 were of this type, 32 were of the infiltrating variety, while 31 belonged to the exogastric type. The endogastric variety are usually small neoplasms, varying in size from a lentil to a French pea; they are round and vascular. In Robert's case, however, the endogastric tumor was the size of an apple. From their seat and size these growths have been known to interfere with the gastric functions, producing uncontrollable vomiting or symptoms of pyloric stenosis.

Two instances have been recorded by Herhold and Kemke,[1] where the patient vomited each meal and even blood, and soon became cachectic from want of food. In a case recorded by Prof. Cornil, a large polypus, measuring 5 cm. long by 3 cm. in breadth and pedunculated, completely obstructed the pyloric opening.

In all parts of the digestive tract, all growths developing toward the lumen of the viscus tend to become pedunculated, this resulting from the thinness of the walls, as well as the peristaltic movements which occur during digestion. Sarcomatous gastric neoplasms are no exception to this rule and their endogastric development is made easy by their pedunculization, while the movements of the stomach during digestion are more marked than in any other portion of the digestive tract.

The type of growth under consideration usually at first have a submucous development and later on project into the lumen of the stomach, pushing the mucosa before them, which, in turn, may become infiltrated with the neoplastic cells and at length undergo an ulcerative process, hence giving rise to hemorrhage, even so serious as to cause death as in Robert's case.[2] Here the growth was pedunculated and the size of a crab apple with an opening at its apex similar to the os uteri, leading into a cavity filled with clot from rupture of a vessel at the bottom of the cavity. The specimen was a fine example of a pedunculated plexiform sarcoma. There are several similar specimens in the Dupuytren Museum at Paris.

When these tumors are macroscopically examined, one is often surprised at their softness, sometimes even diffluent. When a cross section is made the cut surfaces look lardaceous while foci of necrosis and

[1] Herhold, and Kemke, *Deutsche med. Wchnschr.*, 1898; and *Mitt. a. d. Hamb. Staatskrankenanst.*, 1897.

[2] Robert Hémotemèse terminée par la mort due à une tumeur de l'estomac (sarcome plexiforme). *Bull. et mém. Soc. de chir. de Par.*, 1898, n.s., xxiv, 294–296.

interstitial hemorrhages are detected. This aspect of the growth will lead one to suspect its sarcomatous nature, rather than carcinoma.

Infiltrating Gastric Sarcoma. This type is usually prone to simulate gastric carcinoma. Two special types may be described (Lecène and Petit). The first type of infiltrating gastric sarcoma occurs as multiple nodules scattered over the entire gastric walls. The second type homogeneously infiltrates the entire extent of the gastric walls, thus simulating plastic linitis.

The first type is met with as a small nodular tumor varying in size from a millet seed to an almond invading the gastric walls. In some cases there are a large number of nodules with visceral or lymphatic metastases.

In the second type the sarcoma infiltrates the stomach walls making them feel like pasteboard. On account of this infiltration the walls become thickened to the extent of some 2 cm. and when it extends to the orifices it narrows their lumen and when the pylorus is involved signs of stenosis ensue. Then those portions of the gastric walls which are free from infiltration become distended resulting in gastric dilatation. In some instances the orifices are not involved but both curvatures and anterior and posterior walls are the seat of infiltration and so reduce the lumen of the stomach that it may not be larger than that of the normal large intestine. In some rare cases, such as described by Ewald, the entire stomach is infiltrated so that the digestive functions are completely annihilated the stomach acting as a connecting link between esophagus and intestine.

The neoplastic tissue is usually friable, tends to ulcerate and easily gives rise to hemorrhage of severe grade. The foci of ulceration leads to infection and purulent processes, sometimes followed by perforation of the stomach and peritonitis.

Exogastric Sarcoma. This form assumes a particular clinical aspect. The neoplasm which is more or less voluminous, pedunculated or sessile, develops outside the stomach into the peritoneal cavity, and generally do not set up gastric symptoms. This is the commonest type of sarcoma of the stomach, therefore it is the most interesting to the clinician. The exogastric type is special to all connective-tissue neoplasms and we know of no case of carcinoma of the stomach developing outside of the stomach. The size of these exogastric sarcomata is relatively considerable, occasionally that of a fist, but a few have been as large as an adult head. In Bradowski's case (autopsy) the sarcoma weighed 6 kilograms. These neoplasms are usually hard yet frequently present areas of softening, cystic foci and hemorrhagic spots. Cystic formation is interesting as it explains certain diagnostic errors that have been made. The size of the cystic cavities is relatively considerable and in Tedenat's case the pockets contained 4 liters of bloody fluid. The contents may be serous or bloody. In reality they are pseudocysts resulting from foci of necrosis or hemorrhagic areas developing in the midst of the neoplasm. This is common to all sarcomatous growths in general.

These large pedunculated or sessile sarcomatous growths develop in the gastric walls, usually in the muscular stratum, dissociating its fibers and, by their vast development, project into the peritoneal cavity, pushing the serosa in front of them. It is usually on the greater or lesser curvatures that these growths arise, occasionally near the pylorus. From the very fact of their exogastric development, often near the insertion of the omentum, these neoplasms become comprised between the two omental layers, adhering to them so intimately that they have been mistaken for primary neoplasms of the omentum. When these growths arise on the greater curvature—a frequent occurrence—they tend, from their weight, to drop down and hence cause kinks in the stomach and gastric ptosis.

From what very little we know it may be said that sarcoma of the stomach usually respects the gastric orifices which,

on the contrary, carcinoma usually invades from the two curvatures and anterior and posterior gastric walls. I would especially insist upon these clinical peculiarities in the evolution of gastric sarcomata.

Whatever may be the seat or type, gastric sarcomata tend to undergo an ulcerative process, according to some in 50 per cent of the cases. This point is clinically interesting, because it explains the possibility of secondary infection of the neoplasm, followed by perforation and peritonitis. Metastases occur in the lymphatics and the various viscera, but sometimes the process in the lymphatics has been found to be purely inflammatory. Visceral metastases are far less frequent, at least in the early phases of the growth, but when they do involve organs near the stomach, they set up symptoms of primary neoplasms of these organs. I am, however, decidedly under the impression, that lymphatic metastases are not common in gastric sarcoma, any more than they are in sarcomata in general.

Gastric sarcomata are usually composed of fusiform or small round cells. The fusiform variety is formed by small, more or less elongated, protoplasmic bundles, having an oval nucleus. The round-cell variety is composed of small spherical cells with a round nucleus surrounded by a thin layer of protoplasm. In both types myeloplaxes may be present. The cell mass is freely supplied with capillary vessels which often assume a telangectiasic development; and following blood stasis with defective nutrition of the cell masses interstitial hemorrhages arise, as well as degenerative lesions hence creating foci of necrosis and pseudocysts. These growths may also be composed by polymorphous elements—a fine alveolar arrangement, fusiform cells and connective-tissue fibrils forming a fine network circumscribing masses of small round cells. Other tissues may be found giving rise to mixed tumors—fibrosarcoma, lymphosarcoma myxosarcoma and myosarcoma. In most exogastric sarcomata the neoplastic tissue is made up of a mixture of unstripped muscle fibers and round or fusiform cells with a large nucleus.

Sarcomata of the stomach usually arise in the submucosa and then invade the muscular stratum but usually respect the gastric mucosa and serosa.

Symptomatology and Diagnosis. The clinical study of sarcoma of the stomach offers difficulties due both to the infrequency of this morbid process and to the insufficient diagnostic means at present at our disposal, and perhaps above all, the frequent absence of any gastric phenomena. When symptoms do arise they have nothing characteristic and often are mistaken for those belonging to the various gastric affections met with in daily practice, as well as those pertaining to affections of abdominal viscera other than the stomach. In the first circumstance there will be signs of carcinoma or gastric stenosis; in the second there will be symptoms of an epiploic or splenic growth or even ovarian cyst. However, I shall attempt to set forth some general notions respecting the symptomatology and diagnosis which may aid the practitioner.

In the first place we may admit three clinical forms of gastric sarcoma, based upon the symptoms presented, namely: 1. the latent form; 2. an abdominal tumor with gastric phenomena simulating gastric affections such as cancer or pyloric stenosis; 3. an abdominal tumor without gastric phenomena.

The latent form of the disease is very rare, not to say exceptional. But the same cannot be said of the second form which is more frequently encountered. Here we have both objective and subjective symptoms which recall those of carcinoma of the stomach or pyloric stenosis. The patient suffers from pain in the epigastric region after meals, nausea and epigastric distention; sometimes vomiting occurs two or three hours after meals. On examination one finds a dilated stomach and occasionally a swelling in the pyloric region—all signs of pyloric occlusion.

In other cases gastric sarcoma may give rise to symptoms of carcinoma without pyloric stenosis. There is anorexia, emaciation, hematemesis and distaste for meat. By palpation an epigastric tumor and a dilated stomach are detected. There is one point, however, to be especially noted, namely the relative infrequency of hematemesis in gastric sarcoma. In a few instances these patients have presented distinct accidents of tetany which is more common in pyloric stenosis with gastric dilatation.

Sometimes the large sarcomatous tumors, to which reference has been made, set up some gastric disturbances due to dragging on the stomach and deformities of the organ thus caused. These disturbances are anorexia, slight epigastric pain, slow digestion and sometimes vomiting after meals.

From what has been said, there is no symptom which would lead to a diagnosis of the process and that of carcinoma of the stomach or pyloric stenosis has usually been made.

The third form is clinically the most frequent, and likewise the most special, of sarcoma of the stomach. It occurs as an abdominal tumor of varying size without any gastric phenomena. At the onset of their development these growths usually pass unnoticed, hence making the commencement of their evolution difficult to determine. The neoplasm at this time is a small pedunculated or sessile growth developing in the walls of the stomach outside of the gastric cavity, without any subjective sign. Attention is directed to it only when it has attained a certain size. Exogastric sarcomata will usually be palpated in the umbilical or paraumbilical regions, sometimes in the right or left hypochondrium or even in the epigastrium. These growths develop progressively until they reach a certain size—usually rapidly—without giving rise to symptoms other than noticeable loss of weight and asthenia. Ascites has been known to develop. The clinical picture of exogastric sarcomata may be summarized as follows: an abdominal tumor usually in the umbilical region, with a rapid development without any functional visceral disturbances.

On account of the impossibility of making a positive diagnosis because of the absence of functional symptoms the following diagnostic procedures are suggested as they sometimes are valuable. If the tumor becomes mobilized after insufflation of the stomach, it is quite rational to suppose that it is connected with that viscus. If insufflation of the colon pushes the tumor toward the middle line, it is probable that the growth has developed in the omentum at its subcolonic portion, the mesentary or small intestine. If, on the other hand, colonic insufflation pushes the tumor upward to the left under the ribs, one is probably dealing with a neoplasm of the spleen.

Combined vaginal and abdominal palpation will, in many cases, show that the tumor is independent of the genital organs.

The inverted inclined position should never be neglected as it greatly facilitates ascertaining the extent of mobility of the tumor, as well as its anatomical connections. Also, if a subject under twenty-five years of age presents undoubted signs of pyloric stenosis with a perceptible tumor, the latter is far more likely to be sarcomatous than carcinomatous.

The treatment can be summed up in a few words. In the infiltrating form of sarcoma of the stomach, total gastrectomy, if feasible, should be done, otherwise a gastrojejunostomy is in order if there is enough normal gastric wall to make a good stoma.

In the pedunculated exogastric sarcomata, removal of the tumor with free excision of the portion of the gastric wall from which it develops appears to be all that is necessary.

FRACTURES OF THE SPINE

AN ANALYSIS OF CASES AT THE FORDHAM HOSPITAL, 1915-1925*

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INTRODUCTION

OF all the fractures in the skeleton those affecting the spine are the most serious. Even when the condition is recognized early it is a serious problem and difficult to treat. If rational treatment is not provided, early disability is common. In some unrecognized cases, disability may begin late and progress gradually.

There is great difficulty in diagnosis. Kleinberg[1] summarizes this problem as follows, "The difficulty arises from one or more of three very distinct causes: First, the lack of appreciation of the clinical symptom-complex which indicates the existence of an injury to the spine. Second, the symptoms, both subjective and objective, may be so mild that they are readily explained by some simple injury, such as a contusion or a sprain of the back. In fact, they may be so mild that the patient himself does not pay any attention to them until they have lasted for many weeks, or even months. Third, some one symptom may be so prominent as to distract attention from the spine and suggest a condition other than injury to a vertebra."

The profession has not come as yet to a definite plan of treatment, though Osgood,[2] writing for the American College of Surgeons' Committee on Fractures has summarized in a few concise paragraphs the general plan of treatment of crush fractures.

A great deal of the confusion is due to the lack of statistics. Many patients die before careful examinations can be made, while others require treatments for so long a time that they tend to wander and no one physician can follow the case to a complete cure. Most of the fractures occur in industrial work, and in automobile and train accidents, thus complicating the final results through the process of litigation. It might be advisable to gather the statistics of fracture of the spine from time to time and see whether the additional data can prove of assistance in the rational treatment. Since Fordham Hospital gets many cases of spine fracture, a report on the statistics of the last ten years should prove of interest.

For the readier understanding of the subject a brief review of the symptoms and treatments seems advisable.

ETIOLOGY

Fractures and dislocations are most common in athletes and in men whose occupations are such as to render them liable to severe injury. The injury may be either direct or indirect, the latter produced by hyperflexion or hyperextension of the spine.

The human spine is not an extremely flexible structure by itself. Motion takes place mainly at the cervical and lumbar regions. The joints of the spine are many and complicated. There are 134 joints between the base of the occiput and the sacrum, which demonstrates how even small injuries to the spinal column are likely to cause severe disability.

* Read before the Bronx Surgical Society, January 26, 1927.

EXAMINATION OF AN INJURY TO THE SPINE

Scudder[3] suggests, as an aid in the examination of the spine, answering the following four questions: What was the nature of the accident? What does palpation of the spine reveal as to the nature of the lesion? What is the level of the lesion? Is the lesion partial or complete?

GENERAL SYMPTOMS COMMON TO FRACTURE OF THE VERTEBRAE

In fractures of the atlas and axis the patient usually dies immediately. In other regions the symptoms are shock, pain and tenderness at the level of injury, rigidity above and below the region and kyphosis at the seat of fracture especially if it is a crush fracture. If a unilateral dislocation exists, there will be lateral deformity. If the cord is injured there will be partial or complete paralysis up to the level of the lesion. The reflexes are usually absent (except in partial tear where they will be increased later on). There is sphincteric disturbance, urine retention and later on incontinence.

Fractures of the Transverse Processes. These are found almost exclusively in the lumbar region. Symptoms are pain in the lateral abdominal wall (flank) sometimes referred to the knee on the affected side. All movements are painful and limited, especially lateral bending. Marked tenderness is present.

Compression Fracture or Crush Fracture of the Vertebral Bodies. This term is used for an injury to one or more of the vertebral bodies causing an impaction of the spongy bone and a crushing together of the upper and lower surfaces. It is produced usually by forcible hyperflexion or by a force acting in the long axis of the vertebral column when the latter is in a position of slight flexion. The lower dorsal and upper lumbar vertebrae are the ones usually affected.

The anterior portion of the body is most usually affected since the force of the blow is frequently in that direction. Hence in a lateral view of the roentgenogram the body is wedge-shaped. The crush may be asymmetrical, hence lateral deviation. Isolated fragments of bone may be broken off and one of these may project into the spinal canal.

Pain and deformity (angulation-kyphosis) are present at the level of the lesion. The projection of the spinous process produces the kyphosis. Motion of the spine is limited and painful. Pain is increased on pressing down on the head and shoulders in the long axis of the column. There are muscle spasm and tenderness in the region of the fracture. Pressure on the spinous process of the injured vertebrae is particularly painful. Sometimes, however symptoms are so mild that the injury escapes recognition.

Dislocation and Fracture-dislocation of the Spine. These usually consist of a complete bilateral dislocation of the articular facets forward, along with a fracture of one or more of the bodies of the vertebrae. The dorsal region is the one usually involved. It is a displacement of the upper portion of a vertebrae on the lower. The cord is frequently compressed between the posterior edge of the broken body below and the arch of the vertebra above. The compression of the cord is common in the dorsal region as the canal is narrow.

Kümmell's Disease. In some cases, after a period of improvement, there develop pain and weakness of the spine followed by neuralgic and motor disturbance of the legs. There may be a kyphosis. If untreated, these symptoms increase. These phenomena are believed to be due to a rarifying osteitis.

ROENTGENOGRAPHY IN INJURIES OF THE SPINE

A good roentgenogram should be made in every injury of the spine, no matter how trivial it may appear. It must be taken in anteroposterior and lateral directions, and if there is evidence of some comminution, also stereoscopically. In order to get a clear roentgenogram it is necessary to empty the bowels by catharsis and ene-

mata. Kleinberg[1] suggests that the intestine can be displaced during the roentgenography by means of a rubber ball. This is especially valuable in roentgenographing the lumbar spine. The patient is turned on one side and a rubber ball is placed over the lateral abdominal region (flank) between the ribs and iliac crest and pressed down. The intestine will be displaced forward.

While roentgenograms should be made in each case, one must remember that the patient is dangerously ill and should not be much disturbed. It is better to delay the location of the exact site of injury for a few days than to endanger the life of the patient through the disturbance necessitated by the roentgenography. As in fractures of other parts of the body it is advisable to make roentgenograms of several regions, as there may be more than one fracture. Frequently a roentgenogram fails to show a fracture though the symptoms are very suggestive. In such cases another roentgenogram taken a few days later may show the definite lesion (see cases 5 and 6).

DIAGNOSIS

There are a great many cases of injury of the spine, even compression fracture, where there is absence of localized, general or referred symptoms. It is therefore of great importance to emphasize that each injured spine should be examined very carefully, neurological tests being included. Frequent re-examination should be made. Roentgenographs should, of course, be made and carefully studied.

Diagnosis of fracture of the spine should be made on (1) the history of the injury, (2) localized tenderness, (3) localized and persistent pain in the spine, (4) referred pain from nerve roots in the region of the injury, (5) weakness and deformity of the spine, (6) cord pressure symptoms, as abnormal reflexes.

PROGNOSIS

The prognosis depends upon the amount of injury to the spinal cord. It is less grave that it was thought to be a few years ago. In general, the nearer the fracture approaches the medulla oblongata and the foramen magnum, the more serious is the outcome. Death is due in cervical fractures to shock and pressure upon the medulla. In upper dorsal fractures patients ordinarily die in a few days or weeks from hypostatic pneumonia. In fractures of the dorsal and lumbar regions patients die from cystitis, pyelitis and exhaustion.

As to the function of the spine itself, apart from the cord, full recovery of strength and mobility does occur, but it is not the rule. If the patient is a laborer, he will not be able to resume heavy lifting. There is some lack of flexibility. A kyphosis often occurs in the dorsal region.

Cotton[4] says: "Prognosis in these cases, as in those with more obvious deformity, is a matter not of the lesion but of the care given. Recognized in time, properly supported, these cases do remarkably well after six months or a year. Neglected, they become and remain cripples."

TREATMENT

The treatment may be divided into (1) that of injuries without cord symptoms and (2) that of injuries with cord symptoms. It is also advisable to consider the mild cases where the bodies of the vertebrae are not involved. The complications have to be treated very carefully. I shall first consider the treatment in general.

Immediate. After an injury to the back that prevents a man from rising, he should be placed on a flat stretcher. (The position assumed after the injury should be maintained, if it does not endanger life, until the surgeon sees the case). At Fordham Hospital we are accustomed to put the patient on a Bradford frame. After examining him he should be catheterized. Accurate knowledge of the function of the kidneys will then be obtained during the first twenty-four hours.

Direct Treatment of Cases without Paralysis. Forcible correction (especially in dislocation or fracture-dislocation) or open

operation should be undertaken only as a last resort. Treating the bone lesion is the first essential. Immobilization of the spine wih particular attention to the prevention of the increase of the kyphosis is to be done immediately. This can be carried out by fixation in the extended position. The Bradford frame, which allows the patient to lie flat on the back with hips and shoulders strapped down, answers the purpose. Opposite the kyphosis, pads of felt are applied as a corrective measure. These pressure pads are placed on either side of the spinous processes opposite the prominent vertebrae, usually the vertebra below the break. Day by day the padding can be raised without discomfort until the desired correction is reached.

In cases of dislocation of the cervical vertebrae, Taylor[5] advocates "reduction by controlled traction exerted on the head (with counter-traction on the lower extremities) until the spasmodically contracted cervical muscles have relaxed sufficiently to permit reduction by bimanual manipulation on the part of the operator. Fixation is maintained by a plaster jacket involving the trunk and neck, the neck portion maintaining extension of the neck by pressure upward against the occiput and inferior maxilla, and downward against the shoulders."

The method is as follows:

The patient is placed supine on a Hawley fracture table, with the trunk from the waist line upward supported on a narrow metal strip padded slightly and ending between the scapulae. A jury mast is placed so as to give traction on the patient's chin and occiput. Through its two suspension rings which lie just above the vertex of the patient's skull a double bight of clothesline is passed, and, continuing around the waist or pelvic girdle of the operator, it is tied so as to keep the patient's vertex only a short distance from the operator, who faces the patient and grasps his neck in the damaged area. Meanwhile, the lower extremities of the patient are bound to the table, or held by strong assistants, to give counter-traction. Another assistant may be necessary to keep the patient's body balanced on the narrow metal strip between his scapulae.

When everything is ready, the operator applies traction on the neck muscles, gradually and increasingly, by backing his body away while holding the neck between his two hands, thus maintaining absolute control of the whole procedure. The traction is at first exerted in the axis of that portion of the cervical spine above the injury so as to unlock the articular processes of the damaged vertebrae. After traction for a period varying with the strength and degree of spasm of the neck muscles (from five to ten minutes), the neck will be felt to elongate gradually, the bones to unlock, and then the head and upper spine are allowed to sag gently downward while still under traction until reduction is accomplished, the operator's hand assisting by propping the lower segment of the cervical spine and manipulating the upper segment gently with the thumbs, if necessary, to complete the reduction.

Reduction is indicated: (a) sometimes by the patient who feels the bones slide into place, with immediate relief of previous discomforts; (b) by a plate taken by a portable machine and developed while the patient is retained on the table (Taylor).[5]

Cotton[4] says that in some cases the predominant symptom is extreme abdominal pain. It is a sign of nerve root pressure. Occurrence of such pain is an indication for hyperextension irrespective of apparent deformity. (Hyperextension relieves nerve root pressure by opening up the foramen.)

After a few days, when the patient is out of shock, a better immobilization can be obtained by a complete plaster-of-Paris jacket. Osgood[2] and his school at Boston advocate a double plaster shell extending from well above the lesion, over the buttocks, to just above the knees. It must be well padded over bony prominences but closely and smoothly fitted. The patient can lie on this shell on the Bradford frame.

The patient remains in complete recumbency for eight to ten weeks. He is then allowed to try sitting up in a well-fitting jacket or brace. Gradually he is permitted to walk. The support is worn from four months to one year. (I am in favor of keeping the brace for a full year.) The process of healing, which is accomplished

by formation of bony bridges, should be followed by roentgenograms made at regular intervals. Some advocate hastening bony union by an Albee bone graft. In the opinion of many this is advisable only in the dorsal region as the graft immobilizes several vertebrae; however, the immobility is not harmful as the dorsal region has normally very little motion. In the cervical and lumbar regions, which are more mobile, it is a question whether it is not better to allow nature to stiffen only two vertebrae instead of using the graft operation which stiffens many.

TREATMENT OF SPINE FRACTURE WITH PARALYSIS

The advisability of laminectomy to relieve the pressure of the cord is still disputed. After the paralysis has been diagnosed as complete or incomplete, the problem arises as to whether the patient will be benefited by the operation. Some, as Cotton,[4] Wilson and Cochrane[6] and Nicoll,[7] are cautious about advising the operation. Others, as Speed,[8] Scudder,[3] Krause, Estes, Elsberg, Frazier, Bottomley, Allen, McWilliams, Taylor, Miller and Coleman,[9] are distinctly in favor of the operation.

Of course the skilled neurosurgeon would naturally favor the operation. In the hands of the large majority of surgeons the operation is not safe and they are justified in advocating conservative treatment of the injury.

I cite here the conclusions of a few, illustrative of the general opinion.

Speed says:

Primary laminectomy is undoubtedly indicated in many cases and should be done at once after painstaking examination of the patient for decision as to the character of the cord lesion. If there is a marked kyphosis which manipulation does not affect, even in the absence of cord symptoms, operation is indicated for an attempt to straighten out the column or by laminectomy to forestall the chance of compression. Nearly all surgeons who deal with these fractures favor the statement that in known complete transverse destruction of the cord, operation is useless and may hasten death from shock or infection. Though this may be agreed upon as basic, it is not so easy to have an agreement on the symptoms which prove absolute destruction, and the few cases of suture of the cord and recovery after injury or gunshot recorded would encourage the hope that this step should be taken in the seemingly hopeless cases.

Scudder[3] says:

In partial lesions operation may be demanded; in fracture of the laminae and spinous processes operation is demanded; in all lesions operation may be done with the hope of doing some little good. Explore all doubtful cases. Demonstration of a "block" and roentgen ray may help to locate lesion.

Most are of the opinion that in case of complete transversal lesion with an irremediable cord, laminectomy is contraindicated.

To distinguish complete and partial lesion we quote the résumé of Scudder:

In a complete transverse lesion the history of the onset of the symptoms is a sudden one; the symptoms appear immediately following the fracturing trauma; whereas if a partial injury is present, an interval will have elapsed before the symptoms develop; the appearance of symptoms is gradual rather than sudden. In a complete transverse lesion the motor paralysis is found to be complete, and the paralyzed muscles are flaccid; whereas, if the lesion is a partial one, the motor paralysis is limited, some muscles of the limbs are paralyzed, others are not, and there is often noticed muscular spasm in the affected limbs. In a complete transverse lesion sensation is entirely gone; whereas in a partial lesion some sensation is present. The knee-jerks are variable: in the complete transverse lesion they are absent; in the partial lesion the knee-jerks are apt to be absent at first, and they return later. In the transverse lesion the paralysis of the bladder and rectum is complete; whereas in the partial lesion paralysis of these organs is not always present. Priapism, sweating, and involuntary muscular twitchings are seen more commonly in case of injury to the spine associated with complete lesions of the cord than in cases with partial lesions of the cord. In partial lesions variations from the definite types of symp-

toms are seen. The symptoms are more or less irregular.

Coleman,[9] making a study on determination of local compression as an indication for laminectomy, came to the following interesting conclusions:

1. Clinical study of patients with severe spinal cord injuries generally fails to give early information as to the extent of the cord lesion.
2. Laminectomy for spinal cord injuries, except in penetrating wounds, is not indicated unless there is pressure on the cord.
3. Pressure on the cord following fracture-dislocation cannot be demonstrated by clinical study or roentgen-ray examination unless there is considerable vertebral deformity.
4. Complete occlusion of the spinal subarachnoid space following injury should be taken to mean that the cord is compressed in a deformed or normal dural canal.
5. The demonstration of such compression of the cord by the Queckenstedt test or Ayer's combined puncture after spinal trauma should be considered an unequivocal indication for operation.

The question of laminectomy is therefore very much disputed but I do not believe that with our limited number of cases we can tip the scales one way or the other. The decision to operate rested, as in every hospital, on the personal opinion of the examining surgeon or the neurologist. Dr. Taylor, our neurological surgeon, was naturally more inclined to the operation.

To hasten ankylosis of spine some orthopedic surgeons advocate spinal bone graft.

STATISTICS OF OUR CASES

Table I

NUMBER OF CASES ADMITTED

1916	4
1917	9
1918	1
1919	4
1920	4
1921	5
1922	11
1923	7
1924	7
1925	9
Total	61

Table II

SEX

		Per Cent
Male	47	77
Female	14	23

Table III

AGE

		Per Cent
1–10	1	1½
10–20	13	21+
20–30	17	28
30–40	10	16+
40–50	8	13+
50–60	5	8+
Above	3	5
Unknown	4	6½

Table IV

REGION INVOLVED ACCORDING TO SYMPTOMS

1. Cervical			
1–4	4		
4–7	11		
2. Dorsal			
1–10	2		
10–12	2		
3. Dorsal and lumbar	4		
4. Lumbar	18		
5. Sacrum	4	Together with ilium	1
		Together with coccyx	1
		Together with pelvis	1
6. Transverse process	11		
7. Undetermined	5		
Total	61		

Table V

OCCUPATIONS

1. Laborer	11
2. Shoemaker	1
3. Clerk	4
4. Driver	4
5. Painter	2
6. Helper	3
7. Business and professionals	3
8. Students—athletes	4
9. Unskilled worker	5
10. Electrician	3
11. Fireman	1
12. Undetermined	20

Table VI

CAUSE

1. Direct injury	45	(Diving—6)
2. Indirect injury	4	
3. Unknown	12	
Total	61	

TABLE VII

SYMPTOMS*

		Per Cent
1. Without paralysis	23	40+
2. With paralysis	34	59½
3. Deformity	4	
4. Pain and tenderness	29	
5. Not definite	4	
6. Brought in unconscious and never regained consciousness	10	

* Note. In many cases the symptoms could not be definitely made out. It some the histories were deficient. These notes were taken directly from the histories, without change.

TABLE VIII

ROENTGEN-RAY FINDINGS OF SPINE

1. Crush fractures	3
2. Fracture-dislocation	6
3. Fracture	30
4. Fracture of transverse process alone	7
5. No abnormality found	1
6. No roentgenogram made*	14
Total	61

* Many patients had no chance to have the roentgenograms made because either they were brought in unconscious or were too sick to be moved and soon died.

TABLE IX

TREATMENTS*

1. Operations	15
2. Plaster	15
3. Strappings	5
4. Bradford frame	1
5. No treatments	25
Total	61

* After 1918 every patient was placed on a Bradford frame. All these treatments are understood to include the frame. The large number of "no treatments" is due to the fact that many were brought in unconscious, some died within a few days before other treatments were instituted and some were taken home against advice.

TABLE X

RESULT*

			Per Cent
1. Improved	21		34+
2. Not improved	1		1½
3. Died	25		41
4. Unknown	14		23
5. Result after laminectomy		Died	9
		Improved	5
		Transferred	1

* Most of the cases reported in Table x as operated on came in the early years of these statistics, 1915–1916. At this time spine surgery was less highly developed than now. The large number of fatalities is due to the fact that many cases were operated on which in the later years the neurologists and neurological surgeons would have hesitated to submit to such radical treatments, or would have treated conservatively.

CONCLUSIONS

1. Every case of injury to the spine should be examined with extreme care to rule out fracture.

2. Immediate rest should be instituted until the examinations are complete.

3. If it does not endanger the patient, the roentgenogram should be made immediately. Otherwise a delay of twenty-four to forty-eight hours may be instituted.

4. Diagnosis rests on history, localized pain and stiffness of the spine.

5. If the roentgenogram is negative but the symptoms point to a fracture, another roentgenogram should be made in a few days, as it may then show the lesion.

6. Treatments: Rest on Bradford frame then plaster jacket or two plaster shells.

7. If the cord is partially injured and there are positive signs of pressure on the cord, laminectomy is to be considered.

8. If there are no positive signs of pressure on the cord, laminectomy may be advisable.

9. In complete transverse paralysis, it is doubtful whether operation will help.

10. In late cases where pain still exists, a fusion or bone graft operation for the spine should be considered.

REPORT OF A FEW ILLUSTRATIVE CASES

No operative cases are here reported, since this paper deals strictly with the orthopedic treatments. Where operations were indicated they were done.

CASE 1. J. M., male, married, aged twenty-five was admitted July 9, 1924, with the history of having hit his head on the bottom while diving two weeks previously. He immediately lost the use of his left upper extremity and had to be dragged from the water. He had severe pain in the back of the neck and entire left arm for four days. This gradually subsided and finally disappeared. He was admitted to the hospital on account of inability to use the left upper extremity.

Physical examination showed some prominence of the fourth cervical region with slight pain, and spasm on motion of the neck. Left upper extremity completely paralyzed except

slight power in flexors and extensors of fingers. It was evident that the entire brachial plexus was involved. There was also some weakness of the left lower extremity with exaggerated reflexes. Further neurological examination showed a complete crush of the entire left side of the cord. Roentgenogram showed fracture of the fourth and fifth cervical vertebrae with posterior dislocation of the fifth.

It was decided to attempt reduction at first, then if this failed, to perform a laminectomy. On July 14, 1924, patient was put on a Bradford hyperextended frame with jury mast traction on the head. Roentgenogram ten days later showed intervertebral spaces between c4 and c5 enlarged but distinctly visible and displacement reduced; body of c4 changed in outline.

On July 31, 1924 patient was taken off the Bradford frame and a plaster collar was applied to the neck and an aeroplane splint to the arm. He was discharged in August and referred to the out-patient department for observation and massage of the hand.

On February 1, 1925, six and one-half months after the injury, he walked without a limp, and had good power in the fingers, wrist and elbow joints, but no power in the deltoid. He could not raise the arm and thus could not return to work. As the patient had to support a wife and three children it was thought advisable to arthrodese the left shoulder. Consultations were held with several orthopedic surgeons and they all agreed to this.

The patient refused to have it done, however, and preferred to continue massage and exercises for a while. Knowing that he would not be able to return to his original occupation he began to work in a bakery.

Examination in September, 1925, showed marked improvement in the shoulder. He could raise it almost to a right angle, and rotate it inward and outward. On careful examination one could detect that a great deal of the work was done by the other shoulder muscles but the deltoid power had increased immensely. There was no deformity in the spine and no limitation of motion in the cervical region.

Examination in September, 1926, showed absolutely no defect in the deltoid. The patient is working, though he has chosen an easier occupation than before.

Comment. The injury in this case was extensive. By reduction and conservative treatment he regained good power. Even the deltoid, where the return of power was delayed, has completely recovered. It is doubtful whether by an open operation he would have had a better final result.

Case II. G. M., male, aged fifty-one, was admitted July 10, 1925, a few hours after having been struck by a street car. He was in shock and had complete paralysis of all four limbs and no control of the sphincters.

Examination showed that the lesion was in the upper cervical region and roentgenogram showed that there was a fracture of body of c5 with displacement of the fragments. The patient was put on a Bradford frame, and a jury mast with traction was applied at once. In four days he showed some power in the left upper and lower extremities. In a few days more, he began to show some improvement in the right shoulder. On July 25, 1925, he regained control of sphincters. Power in the lower extremities improved.

In October, 1925, he was taken off the Bradford frame and a Taylor brace with chin piece was applied. The patient continued to improve and could even be put in a chair. He used the left extremities better than the right. He refused to wear the brace in spite of our protest. A leather collar was made for him.

In February, 1926 (six months after the accident) he could use the head freely and fully. Power in the feet almost normal. Babinski reflex present. Ankle clonus slight. Power in the left fingers and elbow good. Left shoulder, weak power in the deltoid. Some power in the flexors of the right wrist and fingers. Could flex the right elbow. No pain in the right shoulder. Patient was put on a chair every day. Roentgenogram showed no dislocation. The interspace between c4 and c5 was markedly diminished.

February 15, 1925, began to walk with a walking table. Could put considerable weight on the foot, and on walking put weight on the heels first. Could make a few steps without the walking table. He continued to improve and on August 18, 1926 was discharged from the hospital and ordered to come to the out-patient department for treatments.

January, 1927, walked without assistance though he had slight spasticity on the right side. Dressed and undressed himself. Shaved with

the left hand. Could use the right shoulder but could not flex the fingers well.

Comment. Although there was evidently complete paralysis of the extremities and the roentgenogram showed the fracture, the cord was not entirely destroyed. By traction the cord was released from pressure. Gradually there was complete union of the fragments.

Case III. A. C., aged nine, was admitted September 21, 1918. He had fallen from a tree and was brought to the hospital with complete paralysis of both lower extremities. Roentgenogram showed a fracture of left transverse processes of D10, D11 and D12, fracture of the body of L1, and marked rotation of the vertebrae.

The child was put on a Bradford frame. The neurological surgeon was inclined toward a laminectomy but the neurologist objected. The child was therefore treated conservatively. After two weeks a plaster jacket was applied and later on, a brace. He was discharged on December 13, 1918 being able to walk. He came to the out-patient department for one and one-half years, when the brace was discarded. The last examination showed him walking without a limp. There was kyphosis at D8 and D12, also at L1 and L2. He could bend forward and laterally, though there was no motion in the involved area.

Comment. Although there was a distinct fracture and rotation of the lumbar spine, still the cord was not sufficiently damaged to cause permanent injury. At the early examination it was thought that the pressure on the cord had to be relieved immediately, but it disappeared during conservative treatments.

Case IV. J. C., aged, thirty-eight, laborer, was admitted September 21, 1922, after falling from the first floor and striking the back and head. He was brought to the hospital with paralysis of both lower extremities but control of the sphincters. There was no deformity of the spine but marked tenderness in the region of D9 and D10. Roentgenogram showed crush fracture of L1.

He was put on a Bradford frame for three weeks, then in a plaster jacket. He continued to improve. Plaster casts were then applied to the feet and he began to walk. On March 17, 1923 he was taken out of the hospital by the compensation insurance company. Our opinion was that there was permanent damage to the cauda equina.

The patient was seen again July 10, 1926. He was then walking with a steppage gait, and had no power in the dorsal flexors of his feet. The spine was free. Orthopedic operations for the feet were advised but the company refused.

Comment. While the injury is permanent the improvement is sufficient to enable the man to walk. We feel that had not the company interfered the improvement would have been greater. Orthopedic operations would have helped the feet and the patient could then have returned to work instead of becoming a permanent cripple.

Case V. S. F., Male, aged twelve, sustained an injury to his spine in May, 1921 and was brought by ambulance to Fordham Hospital where he was kept for three days. He showed no symptoms whatever; the roentgenogram was negative, and he was therefore discharged. (He was not seen by me during his stay in the hospital).

He came to my out-patient clinic in July, 1921. He then had marked spasm in the cervical spine. His head was held to the right and flexed forward while the chin turned to the left. Any attempt at motion produced pain. There was tenderness over the spinous process of C5. The pain was relieved by traction on the head. The right hand showed weakness in motor power but no definite signs of paralysis. Marked numbness and cyanosis were present. Roentgenogram taken immediately showed a fracture of the body of C5 and bending backward of the spinous processes. The boy was readmitted to the hospital. A Calot jacket was applied and later changed for a collar. He made a perfect recovery in about ten months.

Comment. The above case demonstrates clearly that the symptoms of a fracture are often deceiving. Not even the roentgenogram showed the line of fracture. It takes a few days to bring out the symptoms and if the case is lost sight of grave consequences may result. It may be worth while to emphasize the necessity of watch-

ing these patients. Relief and recovery were rapid after applying jacket and collar.

Case VI. F. S., single, aged twenty-seven, was brought to the hospital November 1, 1925 in shock. An automobile in which he was riding turned over and injured his back.

There were complete motor and sensory paralysis of both lower extremities and loss of control of bladder and rectum. The roentgenogram at that time was reported to be negative. The neurologist claimed that the injury was permanent. The patient was kept on a Bradford frame and then on an air mattress. He developed bed sores, but after a while was in a better condition to be put into a regular bed. A roentgenogram on February 16, 1926 showed that there was a fracture of the body of D12 and of the twelfth rib on the right side.

In the middle of March, 1926 a Taylor brace was applied to the back, and the patient was encouraged to sit up. On June 9, 1926 a plaster cast was applied extending from the toes to the groin with the feet at right angle and knee straight. On June 10, the patient was put up on a walking table and was able to put good weight on his feet. Braces for the feet were applied on December 18, 1926 and the patient was encouraged to walk.

Examination, January, 1927 showed marked improvement in the gait. The man could walk with slight help and put weight on heels first. Control of bladder and rectum had not returned.

Comment. Although the case was so severe as to give total paralysis and sphincteric disturbance, still the first roentgenogram showed no fracture. There is always a chance of improvement even in bad cases and it is wise to continue treatments for a long time.

Acknowledgment. I wish to thank Drs. Nicoll and Cunniffe, the present surgical directors of Fordham Hospital, and Drs. Taylor and McGrath, the former attending surgeons, for permission to make the studies on their cases. For the assistance of the roentgenographers, Drs. Landsman and Hirsch, I also acknowledge my indebtedness.

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ORTHOPEDIC METHODS
CHARACTERISTIC OF SWEDEN*

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IN many ways the methods of treating crippled children in Sweden are not unlike those adopted the world over. Some of the distinctive methods have been mentioned in discussing the Stockholm unit for the care of crippled children. There are, further, several groups of orthopedic conditions in the treatment of which the Swedish methods are characteristic.

ANTERIOR POLIOMYELITIS

In the description of the day's work at the Stockholm Clinic for the care of crippled children anterior poliomyelitis in various stages was seen to be relatively common. Ever since the great epidemic in 1911 and 1913, this dreaded disease has been reaping a terrible toll in paralysis in Sweden, until the relative percentage of cripples seems to be greater than in any other country. It is said that about 60,000 of the 6,500,000 people in Sweden are suffering from the effects of this scourge. Haglund, through fifteen years of active participation and direction in the care of thousands of cases, has acquired experience that lends authority to his views on the subject. Under the Swedish system, patients can be traced throughout the entire course of their lives. In this way, the therapeutic measures have been improved, and those which stood the test of time have been retained. Experience is important in the outcome and has shown, among other things, that the period of recovery is far longer in a case of generalized paralysis than in one of involvement of a single limb. General principles of treatment are followed and a plaster bed or an ordinary bed and splints insure the necessary rest in the first stage. Individually formed, light, durable splints of celluloid prevent contractures and over-stretching of muscles, and the physiotherapist starts muscle-training exercises and massage in the second stage. Temporary overexertion of muscles is not particularly feared. The early application of plaster casts and of braces is a distinct feature in the treatment of poliomyelitis carried out here.[6] The object is to get the patient up and about as quickly as possible. The idea is based on the principle that the best exercise obviously is not the introduction of freak movement but the training and development of the muscles to perform those duties which they will be called on to execute in daily life. The truth of this idea was in a great measure responsible for the phenomenal success of the renowned instrument maker, Hessing. The perfection of the Hessing types of support (Figs. 1 and 2), which have been adopted with some modifications, makes the execution of this idea feasible. It is to be borne in mind, however, that a brace is not applied until the deformity has been corrected and the extremity has been put into the position intended. The braces almost uniformly meet with the approval of the patients who are concerned primarily with functional improvements and they soon learn to appreciate and demand durable supports. With the development in perfection of external supports, the indications for arthrodesis

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following poliomyelitis have diminished. The operation has not been entirely discarded and good results can be seen at the Clinic. The Whitman astragalectomy for stabilizing the foot, at present so popular in America, is rarely, if ever, seen. Correction of deformities, tenotomy after the manner of Bayer (the so-called Z operation), and the tendon transplantation, with preference given to Biesalski's methods (transplantation of the normal tendon to the evacuated sheath of the paralyzed tendon),

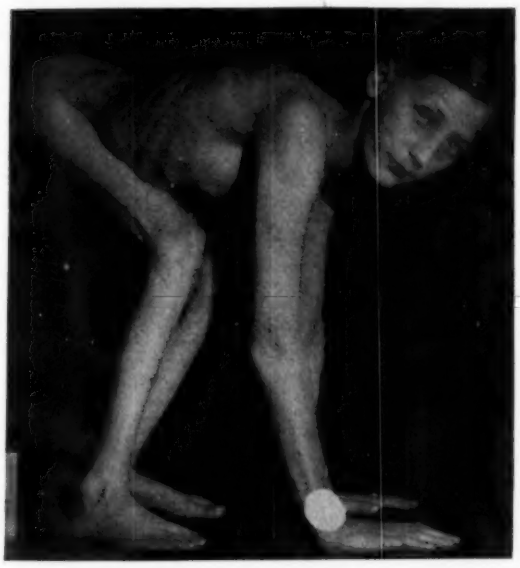

Fig. 1. Quadruped position following anterior poliomyelitis.

are performed as indicated. The severely crippled are improved as much as possible, educated in special schools and, if this is insufficient, cared for in asylums. In this way, Sweden has evolved a system to minimize the disaster of poliomyelitis.

Club-foot

Many types of club-foot with various degrees of severity are seen in great numbers, and in patients of almost every age. The value of beginning treatment early in the life of the patient is appreciated,[4] as are also the difficulties encountered in putting this principle into practice, and so the course of treatment adopted is modified according to the individual circumstances, particularly the distance of the patient's residence from the institute. An infant brought to the Clinic in its mother's arms will be permitted to remain with the mother, who is taught how to execute corrective manipulation and convinced of the importance of these playful movements in the child's future welfare. In a child of four months a correction to valgo-equinus is made and a celluloid splint is prepared to hold the foot in slight overcorrection. To correct the deformity of these small feet, manual manipulation is used, under an

Fig. 2. The same patient walking with a modified Hessing brace.

anesthesia so light that the child's cry can be heard from time to time. Special precaution is taken to prevent anterior displacement of the talus by pushing backward on the foot while correcting the equinus. Small plaster casts, made as light as possible, are applied. Care is taken to hold the correction, to bring the plaster well out under the toes, to give it a straight inner margin, and to model well over the outer side of the foot, about the ankle, and under the anterior arch. The celluloid splints are light and fit exactly.

Several times a day they are removed and the feet are massaged and gently manipulated by the mother or nurse. To combat the inward rotation of the foot and the rotation of the extremity a spiral spring is fastened between the two splints (Fig. 3). When the child has reached the age of about two years it is supplied with shoes, to which the

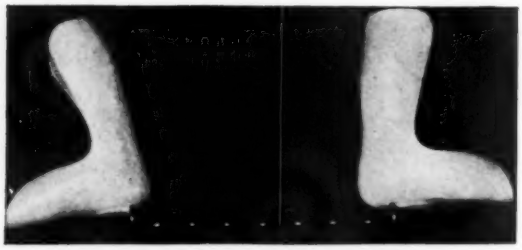

Fig. 3. Night splints for club-feet.

springs may be attached, and the outer margins of the heel and of the sole may be raised. At about two and a half years, specially built shoes with lateral irons, and at four years, light leather and steel braces are the usual choice in bringing the treatment to its completion. In spite of the desired aim to obviate absolutely every residual tendency before the treatment is discontinued, recalcitrant cases with recurring deformity are encountered. For correcting the position, especially in cases of older patients, wooden foot-boards have grown indispensable (Fig. 4). The foot is fastened to a board of proper size by means of a strong, broad sling which can be tightened by twisting with a wooden bar. The excavation of the foot, if prominent, is combated first with radical severing of the tight plantar fascia at its origin from the calcaneous and then, after the dorsum of the foot has been protected with felt, by screwing the foot down onto the board. With the aid of the handle on the board and by means of the bar, leverage can be applied in any desired direction (Fig. 5). After the varus is corrected, subcutaneous tenotomy after Bayer's method is performed, and the foot brought up to a right angle. Before an osseous operation is undertaken, the soft tissue deformity is corrected and it is astonishing to see how willingly a resistant foot will react, after being in a cast a few weeks, to a second manipulation. The Phelps operation is resorted to, and a wedge is sometimes removed to correct a severe deformity. Patience, persistence and experience, with careful technique, bring about results that justify the methods in use (Figs. 6 and 7).

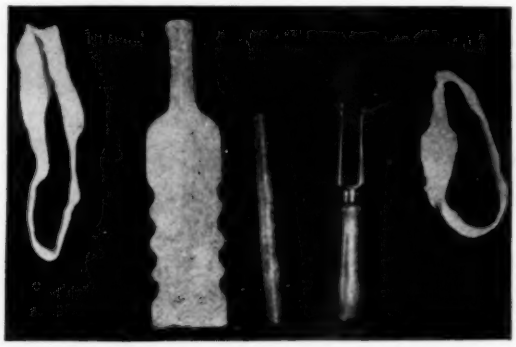

Fig. 4. Foot-board and attachment used in correcting deformities of the feet.

Scoliosis

A third group of cases, occurring in great numbers, and in the care of which good traditions have been established, due to an unusual interest in a subject with notoriously little appeal, is the group of scoliosis cases. Haglund's work[7] has tended to illuminate this dark subject and to improve

Fig. 5. Manipulation applied by means of foot-board.

the method of its treatment. The cases, as they present themselves, are quickly analyzed and classified. Functional scoliosis of adolescence is differentiated from the organic scoliosis which is caused by some pathologic change. Functional scoliosis attracts the greatest interest in diagnosis

as well as treatment. In this, as in every case of scoliosis, the primary point to determine is whether or not functional insufficiency is present. The insufficiency is analyzed as far as possible to determine its origin, whether the functional requirements of the spine have been increased by an excessive or eccentric load or prolonged strain, or whether the functional capacity of the spine has been decreased by diseases that soften the osseous structure or cause muscular weakness, or by a condition

Fig. 6. Congenital club-foot in adult.

bringing about asymmetry of the vertebral column. As far as possible, the factors involved are analyzed and removed. The goal is primarily to obtain a functionally sufficient spine and the treatment consists of combining corrective and gymnastic methods and a corset. In young children the curvature is treated by means of a plaster bed. Ordinarily correction is brought about by means of a specially devised suspension frame, and after the patient has been brought into a position in which (the mobility of the lumbar spine being utilized) the curvature and rotation are diminished to the fullest extent possible, a plaster cast is applied. The casts run high over the chest (Fig. 8), are reinforced with vertical wooden ribs at the sides, and have a large window removed anteriorly. As the patient assumes his upright position natural forces tend to correct the deformity. The casts are replaced as long as there is improvement; then a model is made for a leather and steel corset (Fig. 9). While the patients are still in casts, the physiotherapists teach them corrective exercises which are continued with greater ease during the corset period. The course and results of the treatment are recorded by means of photographs[5] taken under identical conditions, in a specially constructed frame, with the bony prominences, the interspinal line and a few lines over the bulging and sunken ribs marked on the skin. Roentgenograms

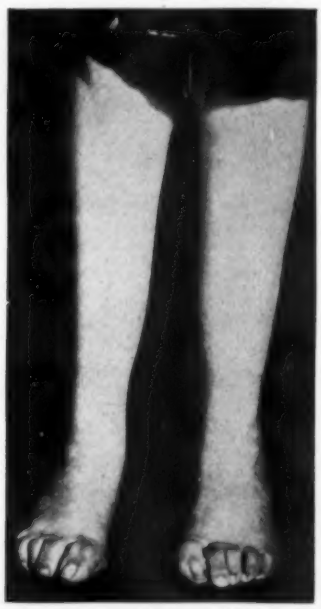

Fig. 7. The same corrected by manipulation only.

are also made; and in this connection it is surprising to see the number of times Scheurerman's disease occurs and the manifold appearance it may assume. These are, very briefly, but a few of the more striking features of scoliosis as worked out by Haglund, and the results of his comparatively simple methods of treatment are seemingly as good as can be reached with the present knowledge of scoliosis.

Spastic Paraplegia

Silfverskiöld has largely contributed to the present method of treating spastic paralysis. The general status of the patient is quickly ascertained and such treatment as offers sufficient, though slight, better-

ment is instituted. The usual procedure for correcting the equinus position is to lengthen the tendo Achillis subcutaneously; but it is considered necessary to use caution in obtaining the proper amount of lengthening. The spastic limb is then put at rest with the foot at right angles, the knee extended and the hip abducted in a large plaster cast. Fixation of the extremity sometimes precedes the operation or is carried out alone, if no surgical interference is necessary. Form-fitting braces are then supplied and the physiotherapists, with great care, teach the patient to carry out ordinary movement properly. The operation described by Silfverskiöld has given good results in his hands. The operation has a rational basis: certain uncrossed two-joint muscles of the leg are changed into one-joint muscles by transplanting their origin. Only if these uncrossed muscles (semimembranosus, semitendinosus, rectus femoris and the long head of the biceps and gastrocnemius) show increased spasticity is the operation performed. The operation is performed, in the words of its originator, "for movements, produced by increased transmission effect of the uncrossed two-joint muscles of the leg and for other disturbances of locomotion."

Fig. 8. Cast applied for correction of scoliosis. The graduated frame is used to facilitate identical conditions in photographic records.

Physical Therapy

I should like to describe the gymnastic institutes and their connection with orthopedics. The fame of Swedish gymnasts began with Ling, whose work was to systematize massage and exercises. His enthusiasm and efforts persuaded the state to subsidize the Royal Gymnastic Central Institute and to legalize the practice of graduates from this institute. Since then, many others have arisen claiming preferment for different methods. To curb charlatanism, a movement arose for supervision of medical gymnastics by licensed physicians, and was shared in by many of the gymnasts themselves. This demanded

Fig. 9. Leather and steel form-fitting corset used to promote function of the back.

an understanding of gymnastic methods by physicians, especially by orthopedists.

The Royal Central Institute clings to the Ling traditions. The system as practiced there is divided into four branches: educational, military, esthetic, and medical. The educational aspect applies primarily to public school children and is intended to place the body under the control of the will. Military gymnastics, taken up chiefly by army officers, brings an external object under the control of the will and includes fencing. Esthetic gymnastics include plastic dancing. The medical division of the system corresponds to what is generally included under physical therapy. It is carried out by thirty or forty students, mostly girls, who take a course lasting two or three years. With adeptness, exactness and specified technique, they execute the movements as outlined for them by the instructor. In the treatment of an injured wrist, for instance, it is first massaged, then a certain number of active movements without resistance and with resistance are encouraged, gentle passive movements are performed, objects of various sizes, shapes and density are grasped, and the strength of the grip is tested. The accuracy with which the movements are planned and the conscientious manner in which they are executed, contribute to the improvement.

At Arvedson's institute[8] there is also a large class of students doing what, to the visitor, seems like similar work. Cooperation exists here with the medical profession. Arvedson was giving a clinic to instruct the students in the diagnosis on a case referred by a physician, with the diagnosis of an old fracture of the clavicle. The examination demonstrated that the fracture was united and that the symptoms were due to subluxation of the acromioclavicular joint and to a capsular injury to the shoulder joint.

Another institute is Kellgren's.[3] Here it is interesting to observe how well blind students can carry on physiotherapy.

At Zander's institute,[9] Zander's son still carries on the original method of obtaining exercise and massage by means of mechanical devices. One cannot help but admire the mechanism of the apparatus and the ingenuity of the man who invented them. No extravagant claims were made for the method; it seemed to commend itself, particularly for patients just past middle age.

At all these institutes, good is intermingled with bad, in different proportions. The old traditions are slowly giving way to modern ideas. The orthopedists have taken what they wished from the gymnasts, and added it to their scientific knowledge. The physiotherapists receive a thorough training and then put themselves under the supervision of physicians.

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AN IMPROVED TECHNIQUE FOR REMOVAL OF WRINKLES OF THE FACE & NECK

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PURELY esthetic surgery aims at the restoration of cosmetic deformities and blemishes, congenital or acquired. This includes removal of wrinkles and the rejuvenation of the face, a problem that has aroused considerable interest in the medical profession as well as among the laity, notably in France. Devoting myself to cosmetic facial surgery I have developed new techniques that seem to me to furnish optimum results. These I desire now to describe to my American colleagues.

The original feature of these new techniques consists especially in carrying out extensive detachments and wide cutaneous resections, while permitting concealment of the incisions, no matter what their length, within the hair line or in the natural folds of the face.

In order to obtain the maximum correction in the treatment of wrinkles and in rejuvenation of the face with an assured durable as well as an immediate result, it is obvious that the old procedures must be abandoned. These consisted in the application of small cutaneous resections. Some of these were in the so-called "raquette" form on the temporal fossa, where the incision was concealed in the hair. Others were in the form of a crescent around the circumference of the ear, with the incision hidden in the posterior fold of the concha.

These scanty cutaneous resections undoubtedly yielded an immediate result, but personal experience and the complaints of numerous patients operated upon by other surgeons have convinced me that the corrections thus obtained were of short duration.

Conditions are altogether different with the procedures to be described here. They have been successfully employed on numerous patients. By virtue of the new techniques, the cutaneous detachments and resections can be made on a very liberal scale, while permitting concealment of the cicatrices. The corrections are more considerable, and their results are more lasting.

Only a very brief description of these techniques is needed here, for the accompanying figures are self-explanatory.

TECHNIQUE FOR WRINKLES OF THE CENTRAL PORTION OF THE FACE

The facial defects corrected by this procedure are: wrinkles at the external angle of the eye, wrinkles and flabbiness of the lower lid, malar region, and nasolabial folds and ptosis of the cheek.

Figure 1. Linear anesthesia is induced along the line of incision *abc* and the crest of the tragus, *bd*. Infiltrate all the parotid and masseter region, *z*. The superior horizontal incision *ab* extends from the upper edge of the insertion of the pinna towards the outer angle of the eye, varying in length with the insertion of the hair. The line of the inferior vertical incision *bc*, makes a right angle with the horizontal incision and extends down to the insertion of the lobe.

Free the cutaneous flap with scalpel or scissors. This flap should be freed in front toward the angle of the mouth for a variable distance and downward toward the cervical region. Dissect the anterior flap parallel with the skin in order to save the filaments of the facial nerve.

Absolute hemostasis is essential for the avoidance of hematomas.

Figure 2. Traction on the cutaneous flap *abc* in the direction of the insertion

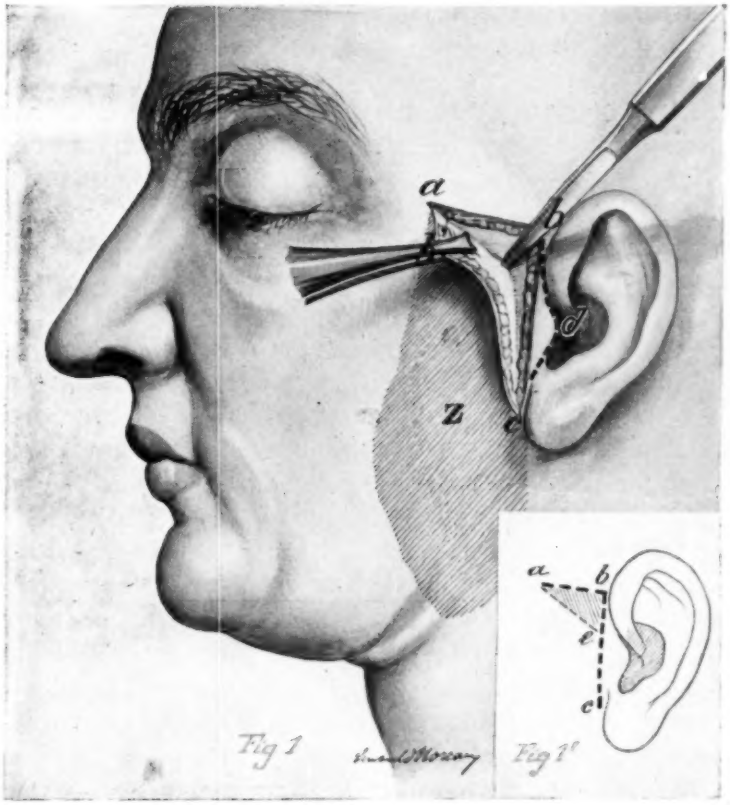
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Fig 1'

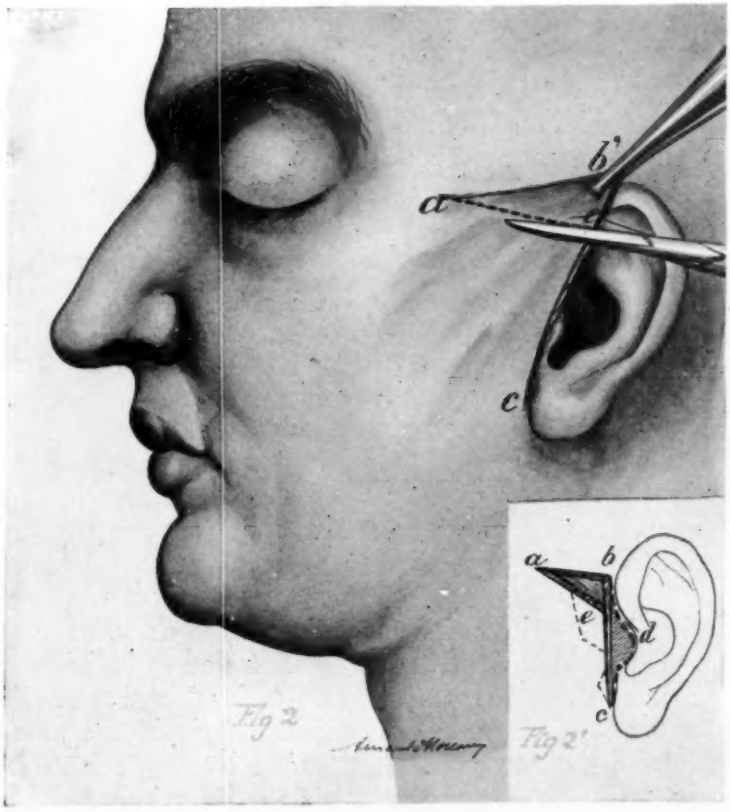
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Fig 2
Fig 2'

of the upper border of the auricle and above, in the direction of a line passing through the middle of the nasolabial fold, will indicate the portion *ab'c* of the cutaneous flap which must be excised. Following the wavy line *bdc* (Fig. 2′), make an incision that grazes the superior incision of the pinna, follows the crest of the tragus, and grazes the anterior insertion of the lobe of the ear.

Denude all the pretragal region bounded by the incision *bc* and by the incision *bdc* (Fig. 2′).

Figure 3. Tailor out of the vertical portion of the flap *abc*, a profile *bc* to be coapted with the exposed portion of the tragus *bdc* (Fig. 3″), this segment to be sutured flush with the antero-superior insertion of the pinna, on the crest of the tragus and flush with the insertion of the lobe of the ear.

First suture the horizontal incision *ab* with medium horsehair, then suture the vertical incision *bc* with fine horsehair.

The result of the operation is shown in the insert (Fig. 3′).

TECHNIQUE FOR WRINKLES OF THE LOWER PORTION OF THE FACE

The facial defects corrected by this procedure are: the nasolabial fold, wrinkles or folds that disfigure the mouth, ptosis of the cheeks, flaccidity of the region of the chin, and double chin.

Figure 4. Lineara nesthesia follows the line *abc*. Infiltrate all the shaded region *z*, that is to say, the posterior parotid region, the lateral cervical region beneath the lobe of the ear and the middle portion and tip of the mastoid region.

The lines of incision are one curved portion *ab*, and a straight portion *bc*, making a right angle with the upper end of the curved incision, on the middle portion of the mastoid region.

The only resisting and solid point for attachment in this region is the periosteum of the mastoid process. If, as in the previously described procedure, we make only a semilunar cutaneous dissection, below the lobe, the scar spreads, the lobe elongates, the ear enlarges and becomes deformed. In this dissection all the resistance and traction are in the line *bc*.

Detach all the shaded area as broadly as possible, forward and downward.

Figure 5. A pull on the cutaneous flap *abc* will show how much must be cut away. This resection is made with scissors, a slice at a time. The same procedure is followed along the straight incision *bc* as along the curved incision *ab*. The resected portion should be broad along the horizontal part as indicated by the dotted line *dc*, but less is cut off along the curved line *ab*.

Figure 6. After the triangular resection *bdc* of the cutaneous flap is finished, suture the lips *bc* and *dc* with medium horsehair beginning at the point *c*. When this suturing is finished, resect all that is necessary along the curved edge *ad* of the cutaneous flap to make the coaptation perfect. Suture the lips *ad* and *ab* with fine horsehair along the groove behind the ear.

The line of suture on completion of the operation is shown in the insert (Fig. 6′).

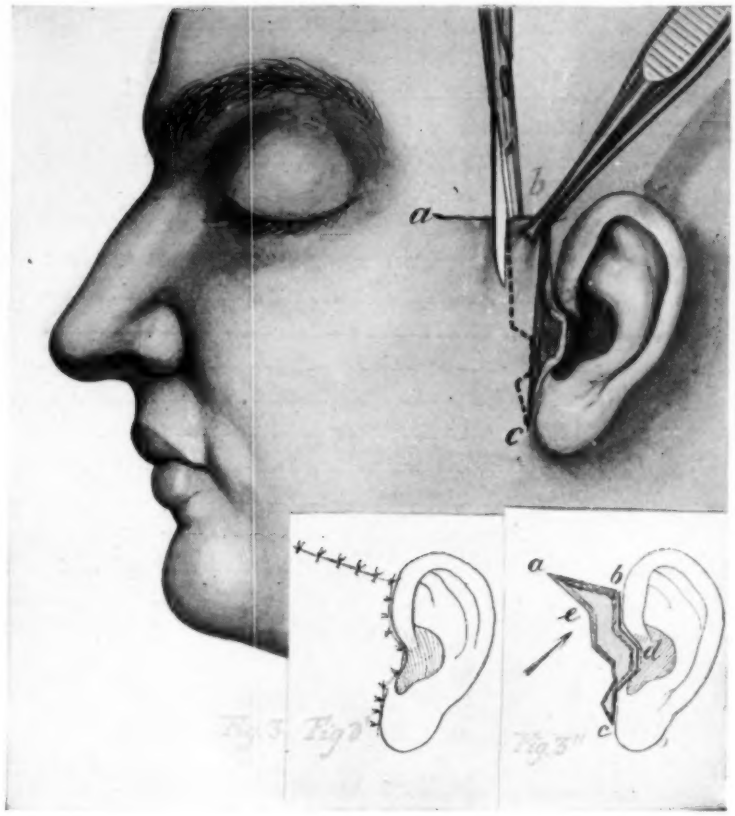
TECHNIQUE FOR DEFECTS OF THE CERVICAL REGION

This procedure corrects the same defects as the previous technique but it also removes all the cutaneous furrows of the neck and does away with the folds, wrinkles, puckers and tendinous ridges of this region.

Figure 7. Linear anesthesia follows the line *abcd*, along the groove behind the ear, over the middle mastoid region and the lateral region of the back of the neck. All the lateral region of the back of the neck should have been extensively shaved, to have the scar covered by the hair.

Employ diffuse infiltrative anesthesia of all the shaded region *z*, the posterior parotid region, the middle and tip of the mastoid region and the upper part of the side of the neck.

The line of incision is along *abcd* in the posterior fold of the auricle, over the middle of the mastoid and along the lateral region of the back of the neck and as far down as as the insertion of the hair will allow.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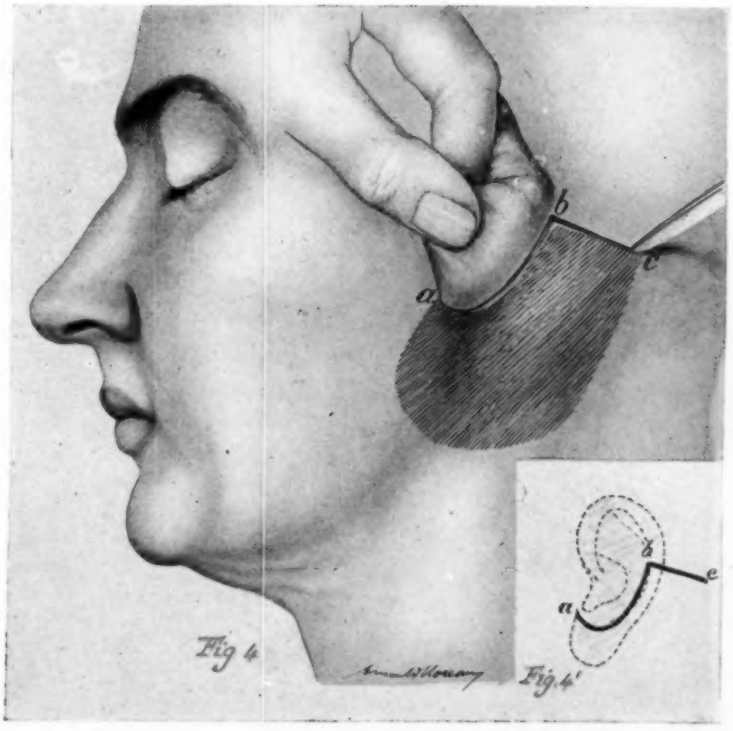
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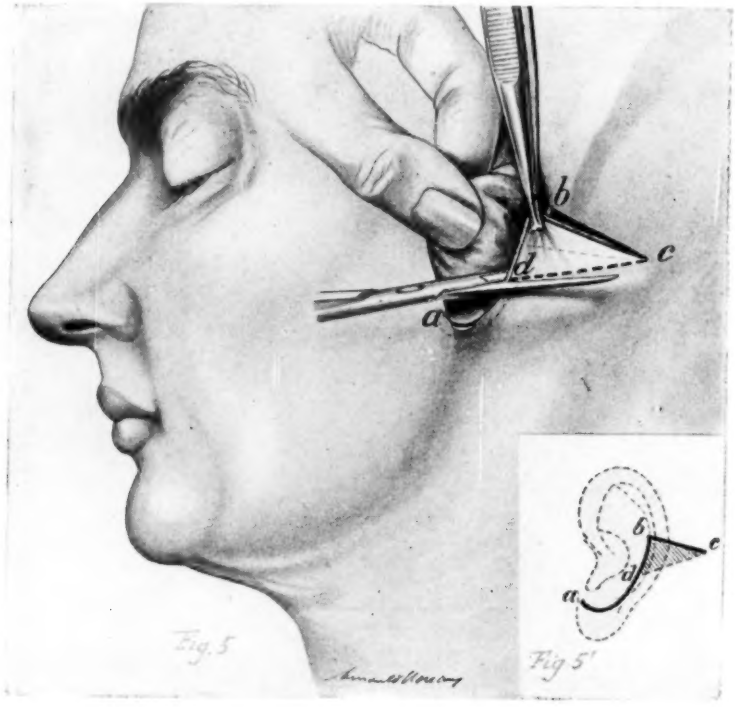
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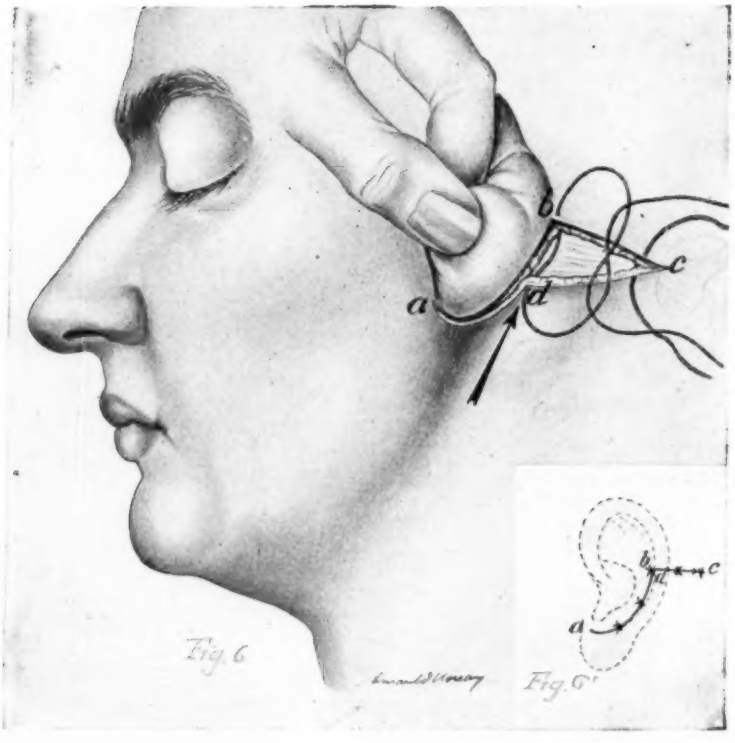
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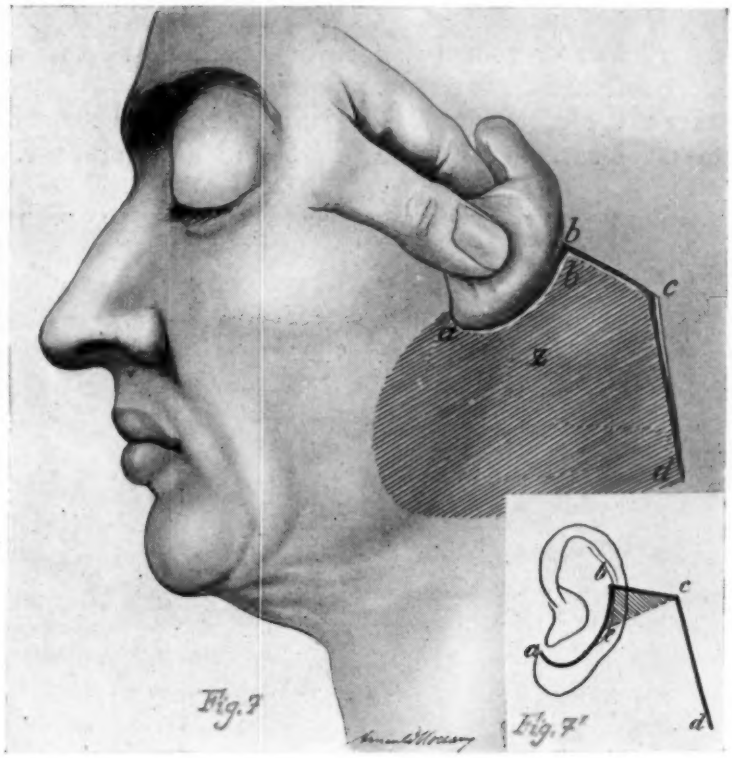
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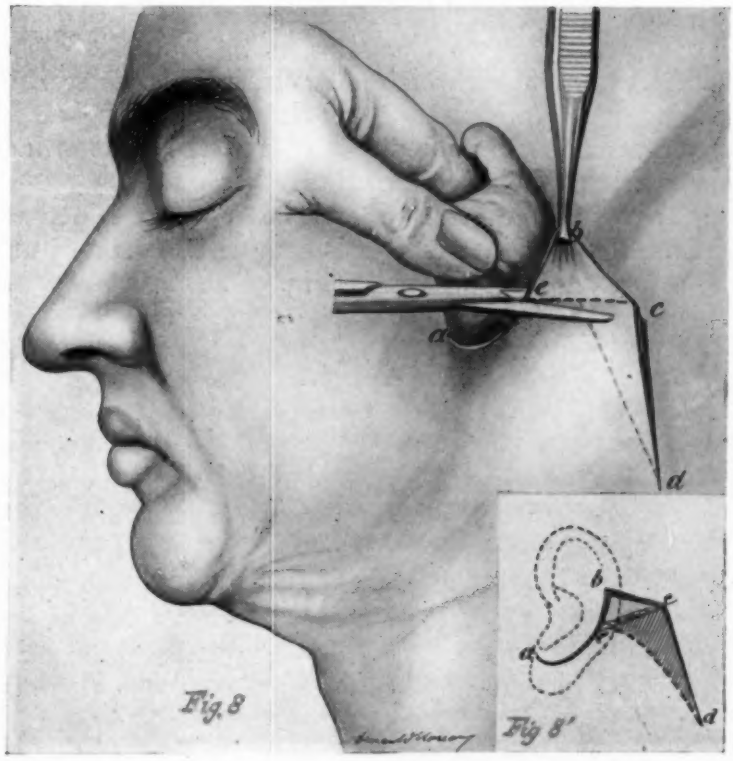
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Fig. 8
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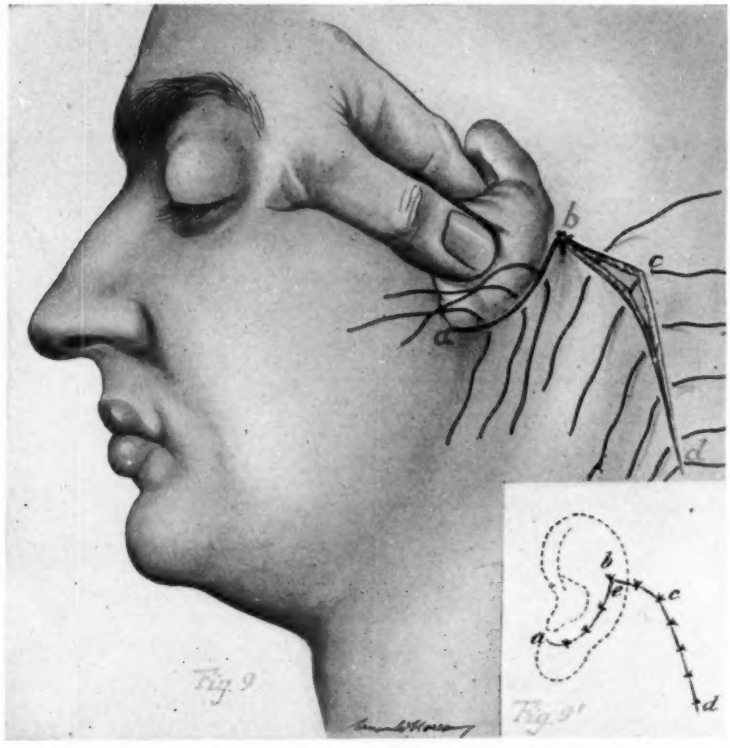
Free all of the cutaneous flap indicated by the shading *z* with scalpel or scissors as widely as possible forwards and downwards.

Figure 8. A pull on the cutaneous flap *aebcd* upwards behind the ear will show the with the lip *abcd* (Fig. 8′). Cut away as much as seems necessary along the curved portion *ab*.

Figure 9. First anchor a solid point at *b* and another at *c*. Then suture the



the triangular cutaneous segment *edc* which must be cut off.

After traction backwards on the remaining flap *aecd*, make a triangular resection to smooth out the furrows in the neck, to guard against puckers of the skin and to assure a perfect coaptation of the lip *aed* curved incision *ab* with fine horsehair, the horizontal incision *bc* with medium horsehair, and the vertical incision *cd* with fine horsehair.

The result obtained when the suturing is completed is shown at *abcd* in the insert (Fig. 9′).

THE IMPORTANCE OF STRICT OPERATING ROOM CONTROL*

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BELITTLE it as we may, hide it as we will, the profession cannot close its eyes to the fact that infection in clean cases is occurring all over the country and even in the best hospitals.

In 1921, while preparing a paper for the Southern Surgical Association, I sent a questionnaire to seventy-five prominent surgeons, located in widely separated sections; and a large majority of the replies indicated the prevalence of infection in clean wounds, in most cases without known cause. Only nine reported freedom from infection, and one surgeon reported as high as 10 to 15 per cent of infection. Lack of strict control was apparent in many instances.

Since that time improvement does not seem to have taken place, infection occurring frequently in the practice of the best surgeons and in the most modern hospitals.

Infection of clean wounds is nothing short of a crime. It is a severe reflection on the surgeon, on whom the responsibility rests, and which he cannot shirk.

The ease with which fairly clean surgery can now be done, compared with the difficulties confronting the surgeons in days gone by, is so marked that the men of today do not realize the dangers to be avoided and the disastrous results that may occur at any time.

Few understand that before the days of antisepsis, hospitals were veritable nests of infection and contagion, with frightful mortality, practically every wound becoming violently infected, and frequently with erysipelas and gangrene. In obstetrics, 1 in 29 died in hospitals, usually with puerperal fever, while the death-rate outside was 1 in every 112 cases; 40 per cent of all amputations were fatal in hospitals, while the death-rate outside was 10 per cent.

Further, the average surgeon of today does not begin to realize the tremendous efforts that had to be made, even as late as the nineties to get good clean results.

Washing, scrubbing and the very free employment of chemical antiseptics were a necessity, in addition to the use of steam and boiling water.

Hospital construction has greatly improved in a sanitary way, and there have been many refinements in sterilizing technique, and yet our hospitals are still potential nests of infection, due to the necessity of handling dirty cases as well as clean.

Every drop of discharge from an infected wound should be caught and destroyed, whether in the operating room or in the wards, if we are to keep the hospitals reasonably clean and safe. Yet how few institutions look after this weighty matter.

Nurses should always use instruments where possible in handling such septic matter, and, when necessary, should use gloves. Their hands and clothing should never become contaminated.

Every one connected with the operating room or the hospital should be taught to fear pus, to catch and destroy it promptly.

The advent of gloves was a distinct advance in clean surgery, and yet today they offer a serious problem.

From my questionnaire, I found that nearly all the hospitals communicated with were using boiling water in sterilizing gloves (a most uncertain and unreliable

* Read before the Hospital Standardization Conference of the American College of Surgeons in Montreal, October 26, 1926.

procedure), and that but few were using chemicals to aid in this sterilization.

It was also found that the same gloves are being used for clean and dirty cases, with incomplete sterilization, and that but few hospitals have a periodical laboratory check on the operating department and personnel.

Until gloves are so made as to permit repeated steam sterilization under pressure, the glove problem will continue to be a grave one. However, it can be aided by gluing a red patch on each glove used in a dirty case, to prevent its use afterward in a clean one, and by soaking the gloved hands in 1 to 250 bichloride of mercury solution.

Hospitals are also, many of them, careless in avoiding leaky gloves, and looking after hands of surgeons and nurses that are chapped or irritated. This latter can be cared for by the use of two pairs of gloves, one over the other.

In the operating room, hand solutions should be of bichloride of mercury and not of sterile water. Even theoretically, as far as bad effect upon the tissues is concerned, there is but little difference between the two, and bichloride of mercury certainly safeguards sterility more perfectly.

The use of antiseptics in wound dressings should be commended. In clean cases bichloride of mercury does less harm than the inevitable infection in an open, clean wound from skin and air. In septic cases it undoubtedly, to some extent at least, lessens infection.

Other antiseptics are also helpful in their places, including wet dressings of weak carbolic acid solution when indicated. The chlorine antiseptics, properly employed, have revolutionized the treatment of septic wounds, dichloramine-T for superficial, and Dakin's solution for deep, wounds. Discharging wounds should be kept securely padded with absorbent materials to prevent leakage, and dressing of all wounds should be done instrumentally, septic discharges and soiled dressings being promptly immersed in antiseptic solutions.

Finally, when the surgeon is in doubt as to strict cleanliness being properly observed, let him here, at least, return in part to old-time methods and safeguards, by free bathing or irrigating with bichloride of mercury solution. The same thought was in the mind of the English surgeon, Godlee, when, in the second year of the Great War, seeing how utterly helpless his colleagues appeared to be in the management of the horribly infected shell wounds, and the frightful mortality, he wrote his splendid article, entitled, "Back to Listerism." In this he urged the profession to return to the freer use of chemical antiseptics.

There are other important points to be strictly looked after in the operating room. The least slip on the part of the surgeons, assistants, or nurses may greatly mar the success of the operation and endanger the life of the patient.

In nearly all hospitals these vital matters are left entirely to the operating-room nurses. While many nurses are safe and do splendid work, yet many of them do not realize as fully as the surgeon the extreme importance of attention to every detail of surgical cleanliness in the operating room. Then too, they are frequently influenced by careless operators to relax in their precautions, and especially if the same operators get fair results. They come to feel that the very strict operators are overparticular and unreasonable. In short, the careful operator is, under the present system, directly at the mercy of the nurse in charge of the operating room.

In a general hospital, where a number of surgeons operate, it is probably unwise to operate on clean and dirty cases in the same room. It is exceedingly difficult under such circumstances to keep the room free from infection. The only way to do this and be safe is to catch and destroy every particle of infectious discharge, and promptly soak every spot on floor or table with a strong antiseptic.

In the early days of antisepsis in this country there existed strict operating

control. In the surgical department of each large hospital there was usually one dominant figure whose standing and influence was so strong as to enable him to direct the policy of the work, even to minor details. Take for instance Arpad Gerster, that great New York surgeon, who did so much to introduce antisepsis into America in a practical way. At Mt. Sinai Hospital, New York, he was the surgical leader, and it required his "sledge-hammer" blows to instill into the minds of doctors and nurses the vital necessity of attention to every detail of antisepsis. But by following his directions to the letter, the results even in the early nineties, when chemical antisepsis was the principal agent in combating infection, the results were well-nigh perfect. Gerster was looked upon as a martinet, but in those times he could have gotten the results in no other way. It is recorded that for thirteen months there was not a single case of infection of a clean wound in that institution.

But today, we have in each large hospital, several good surgeons, no one greatly excelling the others. No one dominates, and the operating departments practically run themselves. The careful surgeons are clean themselves, and urge their assistants to be also clean, but they can go no further. In the nature of things the operators cannot assume full responsibility for the training and watching of the operating-room staff.

Under the splendid influence and guidance of the American College of Surgeons, the staffs of the various hospitals have been well organized and are looking after laboratories, roentgen examinations and histories, but as yet have not attempted the proper and safe control of the operating room.

I strongly advocate that each staff shall select from its number an exceedingly careful surgeon and put the responsibility of the operating room on his shoulders, giving him one or more assistants if desired. He should be a man deeply imbued with the necessity of extreme care in surgical cleanliness, and preferably an extremist in his views on the subject. He should be given full authority over the assistants and nurses of the operating department, investigating their work from time to time, instructing and conferring with them, watching each one of them with an eagle eye, and in short, personally looking after every detail of their work in the conduct of the department. His good sense and tact will readily arrange the necessary rules for both nurses and doctors. With such a man the operating room will be clean as far as it is humanly possible to make it so.

In those institutions where the staff has not full control of the operating department, they should not be content until such authority has been obtained. With the help of the American College of Surgeons and its wide influence, the change ought to be easily accomplished.

In a general hospital, open to all practitioners, the difficulty is greater. Even here those doing the principle surgical work should not be content until the essential control is secured. The problem is greater because of the fact that not infrequently incompetent and poorly trained men may operate, and influence the nurses to be negligent and inattentive. Here the man in charge of the operating room has a more difficult task, that of controlling the nurses and assistants and exercising a good influence over the careless operator. Patience, tact, and good example, as well as regular reports to the medical board, will soon straighten out these difficulties.

In operating-room control the ideal plan is for each operator to have his own operating room and personal staff of assistants and nurses. This is rarely possible except in private hospitals, where there is no earthly excuse for bad results in clean wounds.

It is to be hoped that the subject of operating-room control, including surgical cleanliness, will be taken hold of vigorously by the College in the near future.

ANAL AND RECTAL POLYPS

AS PRECANCEROUS GROWTHS

BRUCE H. BEELER, M.D.

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THE interest in reporting the following cases of cancer of the rectum is that the history plainly reveals each cancer had its beginning in a polypoid growth. As I have collected 4 cases in which the history plainly tells of a benign polyp I feel that we should classify anal and rectal polyps as precancerous growths.

CASE I. (Personal file 1239. G. J. V.) Male, aged sixty-six, clerk, widower. Previous health always excellent.

Family History. No history of cancer as far as he knows. Three sons and two daughters, all living and in good health. Wife died at the age of fifty-six of cardiorenal disease.

Present History. For nine years had noticed that a small lump prolapsed with each stool but after replacing it it gave no further trouble or pain. About three months ago he noticed that the tumor no longer came out at stool. During this time he began to have the feeling of incomplete emptying of the rectum. Soon after he began to pass large amounts of mucus and to bleed. Rectal tenesmus at present is marked.

General Examination. Well developed and muscular, shows no anemia.

Rectal Examination. A hard nodular induration is felt on the posterior rectal wall, lower third. The mass shows deep crater ulceration and deep induration of the gut wall, but is still unfixed.

Diagnosis. Adenocarcinoma of the rectum, in second stage, and from the history only recently a benign polyp.

Treatment. Electrocoagulation in two stages without general or local anesthesia. The first treatment, April 19, 1926, was longer and more thorough, with two other treatments around the edges of the growth.

Results. Recent examination shows that patient is apparently well, with excellent scarring of the whole area.

CASE II. (Personal file 1422.) Female, aged forty-three, single, clerk.

Family History. Father died at sixty-three, mother died at fifty-five, both of cardiorenal disease. One maternal uncle died of cancer of the throat, at fifty-five.

Previous History. Except for diseases of childhood she has always had excellent health.

Present Complaint. Fourteen years ago she first noticed two small hard tumors prolapsing with each stool. These gave no other trouble.

About six months ago she first noticed that one of these tumors no longer came down at stool. About this time she says that she began to pass large amounts of mucus. Three months ago she had a very severe hemorrhage, and another hemorrhage recently finally decided her to brave an examination.

General Physical Examination. General condition excellent. She has not lost weight and shows no anemia. Blood Wassermann reaction was negative: Hemoglobin 85 per cent. Blood count normal.

Rectal Examination. A fixed tumor, about the size of a lemon, situated in the ampulla, posterior and slightly to the left, induration deep with nodular formation and crater ulceration. On the right side at the same level is a benign polyp with pedicle.

Diagnosis. Adenocarcinoma of the rectum. This growth undoubtedly was only recently a benign polyp.

Treatment. Electrocoagulation under gas-oxygen anesthesia, October 23, 1926. Second coagulation January 25, 1927.

Results. The condition on recent examination is good. Growth apparently under control. Some induration but no ulceration. Mucosa is everywhere smooth, no tenderness.

Pain in this case was controlled most successfully by the administration of colloidal gold by mouth.

CASE III. (Personal file 197.) Female, aged seventy-three, single, referred by W. W. Wilson,

Henderson, Ky., for control of the bleeding from an inoperable cancer of the rectum.

Family History. Negative for cancer.

Previous History. Always had good health, but for some years she had been troubled with a small hard tumor prolapsing at each stool. This did not annoy her otherwise.

Present Complaint. She recently noted that the small tumor no longer came out at stool, and that she began to pass mucus and some blood. For a week loss of blood has been very great and patient is profoundly anemic, suffering with dyspnea and fatigues easily.

Rectal Examination. A large nodular, deeply indurated growth on posterior bowel wall, lower third. With traction this mass can be prolapsed out of the rectum.

Diagnosis. Adenocarcinoma of the rectum, second stage, which from the history was only recently a benign polyp.

Treatment. December 14, 1922, merely to control the hemorrhage, under local anesthesia, the whole area was sutured with catgut, starting on the edges. This contracted the mass to half its size and controlled the bleeding.

Results. Letter from family physician said that after a stormy five days she began to improve. Patient has been examined since on two different occasions and she is apparently well. The induration can still be felt but the mucosa is smooth and she has not lost blood. The growth is evidently arrested by a very simple procedure.

Case IV. (Personal file 533.) Mrs. L., married, aged thirty-three.

Family History. Mother and father both living in good health. One sister, living in good health. No history of cancer.

Previous History. Has not been well for past six years. Six years ago had a rectal operation for abscess and fistula. She says previous to this operation she had noticed a small tumor prolapsing at stool which she would replace. It gave no other trouble.

Two years ago she underwent an examination because of rectal discomfort and passage of large amounts of mucus. She noticed then that the tumor no longer prolapsed.

General Physical Examination. Profoundly anemic, and shows loss of weight. Wassermann reaction negative. Hemoglobin 70 per cent.

Rectal Examination. Well-defined adenocarcinoma within reach of the finger. From the history this at one time was a small benign polyp. Cancer completely encircles the bowel lumen and the induration and crater ulceration are marked. The pelvis is probably also involved.

Biopsy Report. (W. C. Caldwell.) Section shows adenocarcinoma in dense fibrous tissue stroma and smooth muscle. Cancer has invaded the entire thickness of the specimen and the cells in some places form typical mucous glands very similar to those of the intestine. I feel certain that we are dealing with an adenocarcinoma that probably orginated in the rectum or sigmoid.

Treatment. Patient would not consent to colostomy. Radium treatments given by needling methods beginning December 14, 1923. Death occurred February 10, 1925, of carcinosis.

SUMMARY

1. Cancer of the rectum is very frequently the result of long-standing polypoid growths.

2. Diarrheas and mucous colitis call for very careful examination.

3. All rectal complaints should be investigated, digitally, at least. The discovery of a rectal or anal polyp may mean one less death from cancer of the rectum if properly treated.

4. Electrocoagulation offers a very good method of controlling cancers situated posteriorly in the ampulla and within reach of the finger. The success of the treatment depends wholly upon the stage in which one discovers the growth. In the first stage of development we can cure; in the second, we can only arrest and control loss of blood and pain. Cancers in the third stage are inoperable and cannot be cured by any known method.

THE TECHNIQUE OF CHOLECYSTECTOMY

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Surgeon to the Lucy Hastings Hospital

MANCHESTER, N. H.

SINCE cholecystectomy is the most successful operation in treating the larger number of pathological gall bladders, it is the desire of the surgeon to perfect his technique of this operation. With this end in view I have tried to study each move in the operation and to develop the system in such a way that time can be saved and efficiency gained.

I use the Bevan incision for it seems to give the easiest approach to the most complete work. When the incision is completed the dome of the gall bladder is grasped in two areas by peritoneal clips, lifted and delivered through the incision.

Two gauze packs are then placed about the area, one of which pushes the stomach, duodenum and intestinal loops down to the left. This gauze pack is anchored with a curved hemostat placed to the left of the incision. The second gauze pack is placed above to the right, thus protecting this area, and is anchored with a curved hemostat placed to the right of the incision. In this way the entire extraneous, intraabdominal field is protected from any contamination and all the parts are kept from protruding into the field of operation.

With a very sharp scalpel the gall bladder is next circumcised at a point approximately one inch from the central point of the dome and through the serous coat only. With tissue forceps this serous covering is peeled backward and downward until the cystic duct is reached. By peeling back this coat the cystic artery can be grasped in a clamp which permits a very free separation from the under side of the liver.

The cystic duct is then carefully dissected away and at its lowest point is clamped in two areas, one proximately and the other distally. A flat sponge is then placed beneath these clamps and the cystic duct is incised in order to free the gall bladder and permit its delivery intact.

The stump of the cystic duct is then transfixed with a No. 1 chromicized catgut suture and firmly ligated on both sides of the clamp so as to effectually close this stump. The serous covering, previously deflected, is now grasped with tissue forceps and gathered up around the cystic duct stump in order to form a bag for it. This coat is then firmly tied with the loose ends of the cystic duct ligature. Following this tying these loose ends are made to encircle the cystic artery and firmly ligate the latter.

By this procedure the cystic duct stump, serous bag and cystic artery are all firmly ligated and fixed to a point beneath the under surface of the liver. When healing is completed this well-covered and protected stump becomes firmly healed to the raw surface line previously represented by the area of gall-bladder fixation to the under surface of the liver. It will also be noted that by following out this technique no raw surface is left over which postoperative adhesions may develop.

The field is carefully surveyed to detect any oozing points and the two gauze packs are then withdrawn. All parts are allowed to drop into their normal positions and it will be seen that no raw surfaces are left in view, so that the field resumes its previous aspect minus the gall bladder.

The abdominal wound is closed in the usual way. This technique permits of a speedy, accurate and yet safe operation and when systematically developed allows a comfortable convalescence.

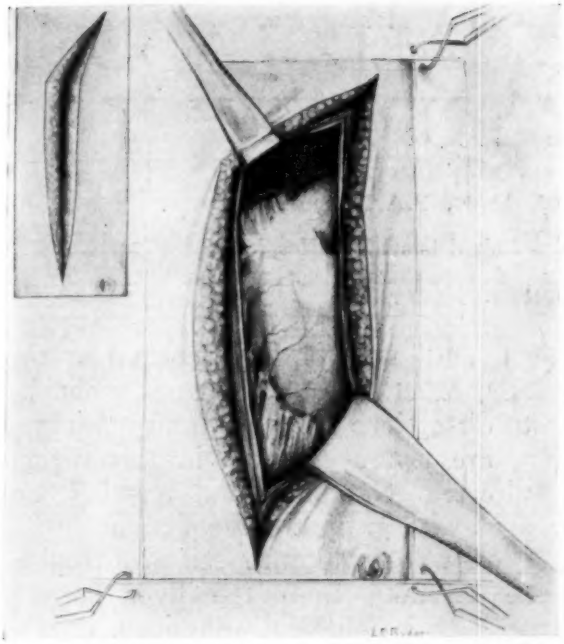

Fig. 1. Incision retracted, revealing stomach drawn over toward the liver by adhesions. Insert shows the skin incision.

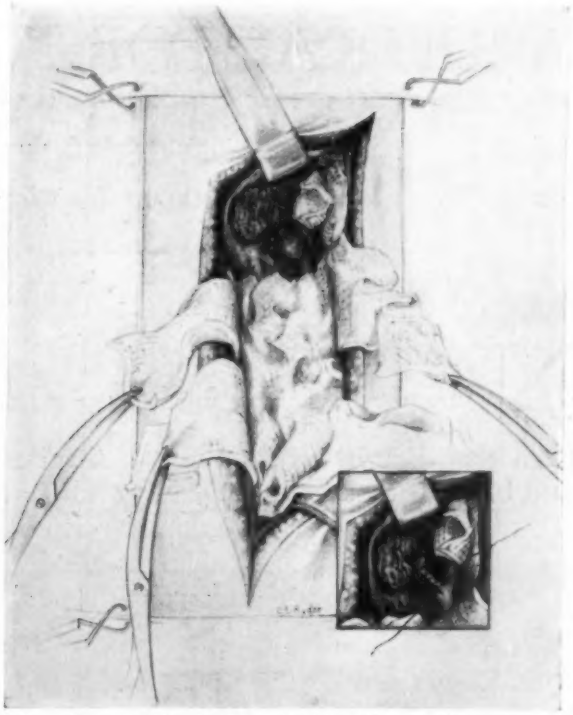

Fig. 2. Stone lodged in cystic duct. Insert shows suture of cystic duct after stone has been removed. Note the packing which protects all surrounding areas.

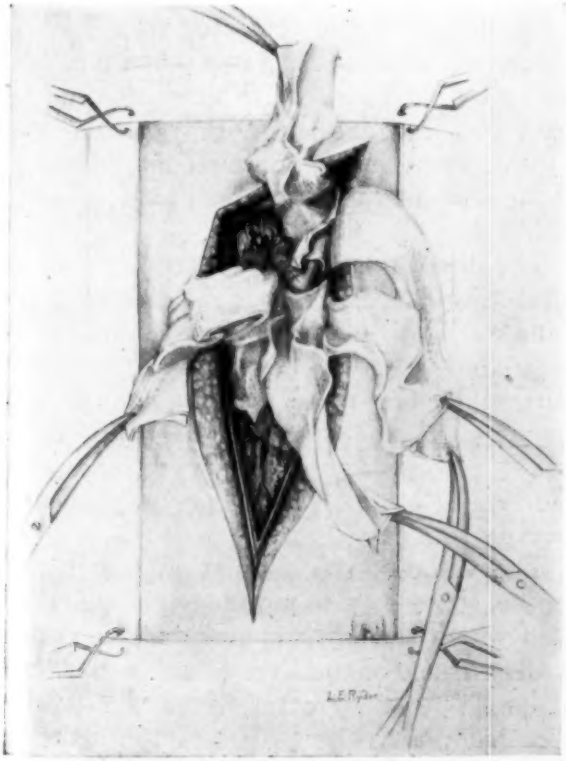

Fig. 3. Sutures and incision in cystic duct, and all areas carefully protected by gauze packing.

Fig. 4. Incision closed with gauze packing and drainage to the stump of the cystic duct. Packing drawn larger than normal for pronounced illustration.

A RETRACTOR FOR GALL-BLADDER AND BILIARY SURGERY

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BROOKLYN

NO surgery is more exacting in its demand for ample exposure and precise structural visualization than that pertaining to the gall bladder and biliary ducts, especially in working at the junction of the cystic and common ducts (the danger angle) it is imperative to isolate and identify clearly the individual structures. False anatomical relations particularly of the cystic and common ducts and neighboring structures and vessels, whether due to true anomalies or to distortions resulting from inflammation, are not uncommon in this region. Ill-directed clamping and cutting are fraught with gravest consequences.

FIG. 1. Hod-shaped retractor for surgery of the biliary tract.

Those who have contended with troublesome bleeding from the liver surface, gastrohepatic fold and adhesions, or who have encountered the sudden, brisk hemorrhage from a severed cystic artery or its branches, or who have struggled in the depths of an obese abdomen with liver and ductal structures fixed by inflammatory exudate and adhesions, will appreciate an efficient retractor.

By means of the retractor that I have developed, so adequate an exposure of the operative field is obtainable with the patient in the usual horizontal position that I have been led to discard employment of the semi-sitting or reverse Trendelenburg position.

The instrument (Fig. 1) consists of a retracting plate set at right angles to a handle. This plate is hod-shaped and angulated to 120°. The width of the larger portion of the plate is 2 inches, of the smaller, 1¼ inches; and the length of each is 4¾ inches. The entire lower edge and the lateral edge of the larger portion are heavily rodded (⅜ inch).

The value of the angulation lies in the ample, somewhat diamond-shaped working field which the instrument forms with the under surface of the liver (Fig. 2). Because of its shape and greater width the instrument supplants the two retractors usually employed and thus frees one hand of the assistant for other service. The wider

portion of the plate prevents the intrusion of the stomach into the field while the narrower serves the same function with respect to the colon. The use of this instrument will decrease the number of laparotomy pads usually required and the trauma attending their use. Protection of the liver, gastrohepatic omentum and duodenum and of the posterior parietal structures from injuries during retraction is afforded by the rodding of the edges; and by the added weight and broad surface of the instrument the assistant is enabled to retract with a better perception of the relation of the blade and edges to the deeper structures.

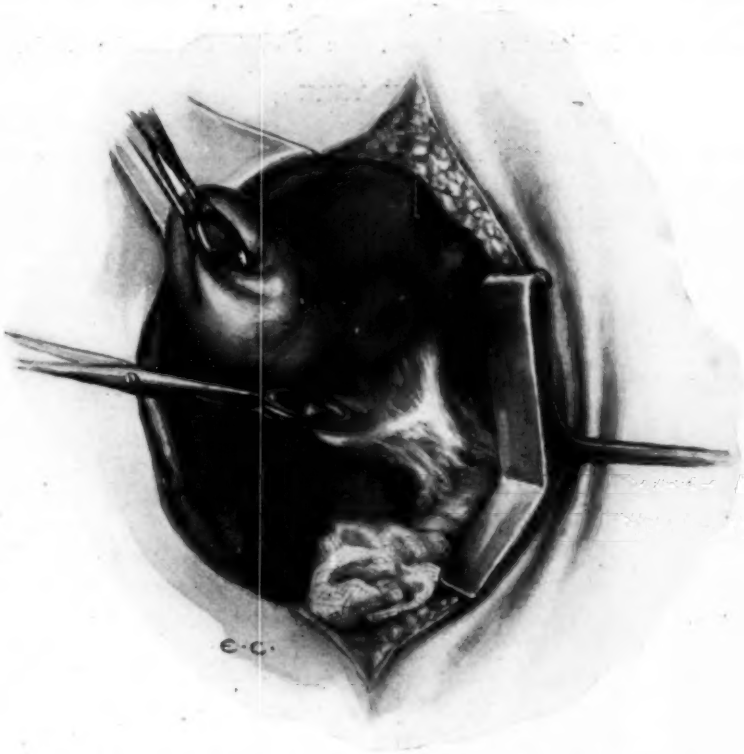

Fig. 2. The retractor in situ showing adequate exposure of structures in the diamond-shaped operative field.

CALCIFIED INTERVERTEBRAL DISK

A CASE REPORT

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A careful survey of both American and foreign literature has revealed only two cases[1] on the subject of calcified intervertebral disk. Calcification of a meniscus in the knee is seen occasionally in roentgenograms, but so faintly that the

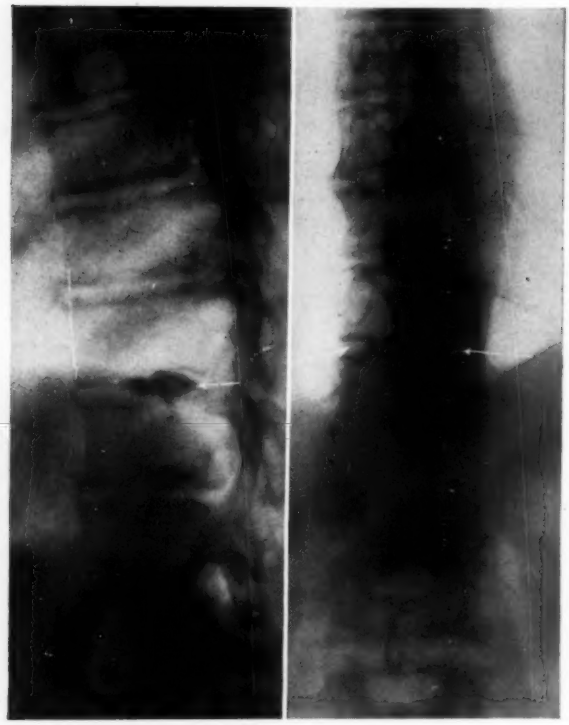

FIG. 1.

diagnosis is often questioned. The case presented here, however, is so sharp, so clear, so well defined that there can be no doubt as to the diagnosis. It is the first of its kind that I have seen, and the first seen by orthopedic colleagues in practice twenty years and more. It seems to be the first case recorded in this country.

[1] Barsony, T., and Polgard, F. Calcinosis intervertebralis. *Klin. Wchnschr.*, 1925, iv, 759–760.

Bacon, A. A new disease of the spinal column. *Ztschr. f. Kinderheilk.*, 1923, civ.

Mr. R., aged fifty years, married, truckman, was referred to me with the complaint that for a year his right leg had been getting gradually weaker. Associated with this was pain in the lower back which radiated to the left. He noticed that he could not walk upstairs or downstairs except by dragging the affected leg.

He had had no other disturbance before, had no renal or cardiac defect or gastrointestinal disease, and, indeed, was always in the best of health. He had a right drop-foot, weak right Achilles and knee-jerks, and diminished strength in all the muscles in the right lower extremity as compared with the left. There was no disturbance in the pain, temperature, tactile sensibility, or deep muscle sense, etc. No atrophy of the limb was present. Frequent fibrillar contractions in the muscles of that leg were seen. Wassermann reaction negative.

A roentgenogram of the dorsolumbar spine reveals a shadow in the interspace between the tenth and eleventh dorsal vertebrae. It is in the exact location of the pulp area of the intervertebral disk. Lipping of the bodies of the vertebrae is also present.

This was discovered incidentally, has nothing to do with the clinical findings, and probably causes no discomfort.

A word about the structure of the intervertebral disk will not be amiss here. The upper and lower surfaces are firmly adherent to the thin hyaline cartilage plates on the bodies of the vertebrae. Anteriorly and posteriorly it is adherent to the anterior and posterior common ligament. Laterally, in the dorsal region, it is adherent to the interarticular ligaments. The disk itself consists of two parts—an envelope and a core. The former consists of vertical plates of fibers, one within the other and grading in structure from ordinary fibrous tissue with criss-crossing strands on the outer part to white fibrocartilage on the

inner part. The core is yellow and consists of highly elastic fibrocartilage, soft and pulpy in character with some elastic fibers running through it. It is under great tension, so much so that when the envelope is slit horizontally this core rises up above the level of the surrounding tissues.

Bridges of bone between vertebral bodies are often found. They are seen commonly in hypertrophic arthritis in the form of lipping, in typhoid spine, etc. But the lime deposition is in the fibrous extreme outer portion of the disk and in the anterior and posterior ligaments and not at all in the fibrocartilaginous portion or the pulp area.

The sharpness of outline of the calcified area in the roentgenogram here shown, its location, its independence of any bony structure, places it in the pulp area of the intervertebral disk.

I wish to express my thanks to Drs. Arthur C. Linden, Caccio and Finkelstein for their help.

[SURGICAL SUGGESTIONS]

CARCINOMA in both breasts occurring simultaneously offers no hope from operation; carcinoma in both breasts developing consecutively is by no means hopeless.

COMMONLY mistaken for mammary carcinoma is a lymph gland swelling just at or beyond the upper, outer margin of the breast. This swelling—painful, tender, sometimes suppurating—is an infection of the *infero-external* portion of the thoracic chain of axillary glands. It lies over the fourth and fifth intercostal spaces at the edge of the pectoralis major and receives the lymphatic vessels of the lower lateral thoracic and upper abdominal wall. A swelling here is apt to be due to a furuncle or other infection near the waist line. The *supero-internal* portion of the thoracic, pectoral or anterior chain of axillary glands overlies the second or third intercostal space beneath the pectoralis major and receives anterior cutaneous and mammary lymphatics, and this portion is often early involved in breast cancer.

TRANSACTIONS OF
THE SECTION OF SURGERY
NEW YORK ACADEMY OF MEDICINE

Meeting of March 4, 1927

THE CHAIRMAN, DR. FREDERIC W. BANCROFT, PRESIDING

THE PRESENT-DAY APPROACH TO THE PATIENT WITH HYPERTHYROIDISM

DONALD GUTHRIE, M.D.

SAYRE, PA.

THE marked reduction in the operative mortality and in the morbidity of the surgical treatment of hyperthyroidism in the past twenty-five years has been due to a better understanding of the diseases of the thyroid gland rather than to any improved methods of technique.

Formerly, the mortality of the surgical treatment of hyperthyroidism was very high because only the most severe cases which had resisted prolonged medical treatment were given the benefit of surgery. All toxic goiter cases were considered generally in a medical light and surgery got the blame for many deaths which would have been credited to the medical side had there been a little more delay. Von Eiselsberg lost three of his first four cases; C. H. Mayo lost four of his first sixteen patients; three of the next thirty, one in the next seventy-five, and four in the next two-hundred and seventy-eight. This, no doubt, was a lower mortality than that of many surgeons at that time who made so bold as to accept goiter patients for operation, but one which would not be tolerated by the laity today; for with the present understanding of the thyroid and its diseases many clinics report a mortality of less than one per cent in exophthalmic goiter cases and from one to two per cent in toxic adenoma cases.

The factors responsible for the reduction in the mortality and the morbidity of hyperthyroidism have been the following:

A better understanding of the intense waves of hyperthyroidism, and the importance of avoiding operation during these acute exacerbations.

The multiple stage operations for the bad-risk goiter patient.

The differentiation of the diseases of toxic adenoma and exophthalmic goiter.

The discovery of thyroxin.

The metabolism test as an accurate estimate of the degree of hyperthyroidism.

The use of Lugol's solution in the preparation of the exophthalmic goiter patient for operation, better anesthesia, team-play and improved methods of technique.

In 1906 when I began my work in surgery, all goiter patients, except those in extremis, were accepted for the operation of radical thyroidectomy; and postoperative hyperthyroidism at times so terrifying and so often fatal was seen at its worst. Any patient who survived a thirty-six hour session of this intoxication was thought to be safe. While postoperative hyperthyroidism still occurs, we rarely see the storm at its height as we did in those days.

Plummer in 1907 emphasized the importance of avoiding operations upon exophthalmic goiter patients during the stages of increased intoxication and urged that these patients be accepted for operation during a

relatively quiescent period. He described in detail the symptoms of the gastric crisis at this time and stated that an operation attempted during this stage, or within too short a time following it, would surely be attended with a fatal outcome.

In 1908, upon the advice of Kocher, ligations were first employed in this country by Crile, Mayo and Tinker. The bad-risk exophthalmic goiter was treated in this way, radical thyroidectomy being reserved for the less intoxicated patient. With the advent of multiple stage operations the mortality of the disease decreased but the morbidity increased.

In 1912, Plummer disassociated adenomatous goiter with hyperfunction from exophthalmic goiter believing that the former disease was due to the presence in the body of an excess of the normal thyroid product and that the latter was caused by an abnormal one.

In 1914, Kendall isolated the active principle of the thyroid gland—thyroxin, sixty-five per cent of which, by weight, is iodine. He believes it to be a dynamic catalytic agent hastening the rate of energy transformation in the body. He has found the amount of thyroxin in the tissues of a normal adult is 14 mg. and that the thyroid gland delivers approximately 0.33 mg. of thyroxin daily. The principal function of the thyroid gland is to maintain 14 mg. of thyroxin in the body and to deliver 0.33 mg. of thyroxin daily. It may be assumed that the administration of sufficient thyroxin to maintain 14 mg. of thyroxin in the body will place the thyroid at rest; 1 mg. of thyroxin elevates the basal metabolism 2.8 per cent.

To understand the modern approach to the patient with hyperthyroidism, it is important for us to review briefly an acceptable classification of goiter, to differentiate between the toxic adenoma and exophthalmic goiter, to accept Plummer's hypotheses that the peculiar symptoms of exophthalmic goiter are due to an uniodized presecretion, and to review the use of Lugol's solution in the preparation and after-care of the exophthalmic goiter patient.

Goiter may be classified as endemic and exophthalmic; the endemic as the diffuse colloid and the adenomatous; and the adenomatous into the adenomatous with and without hyperfunction.

A relative or absolute deficiency in iodine for normal thyroid function is undoubtedly the cause of endemic goiter. This deficiency in iodine causes a subnormal delivery of thyroxin to the tissues of the body—hypothyroidism resulting.

Diffuse colloid goiter may be congenital. It is much more common in females than in males and is seen frequently at puberty and in pregnancy due, no doubt, to the stimulation of a gland functionally damaged by an increased exhaustion of thyroxin in the body. This increased stimulation of the gland is shown by hypertrophy, a change in the secretory process in the gland, the storing of colloid in excessive amounts, increase in vascularity of the gland, great enlargement of the vessels with thrills and bruit at the poles—the hypothyroidism, by the reduction of the metabolic rate, minus ten to minus eighteen, although the true myxedema developing later in life is not connected in any way with early diffuse colloid goiter.

It is in these large diffuse colloid goiters that one sees the extraordinary action of thyroid feeding and the remarkable immediate effect of the intravenous administration of thyroxin. After the intravenous injection of a sufficient quantity to bring the metabolic rate up to normal the bruit and thrills at the poles disappear after twenty-four hours and there is a remarkable shrinkage in the size of the gland. This improvement may be continued by using enough thyroxin to maintain a normal basal metabolic rate. All symptoms will return if thyroxin is discontinued. Many of these patients may get relief if judiciously and carefully fed with the dessicated gland. With such ready control of these large goiters, a surgeon, if he realizes the immediate benefits of such therapy

just described, rarely accepts a case of diffuse colloid goiter for operation even though the growth be substernal and causing symptoms of mechanical obstruction to respiration at the time of examination. It is always safe to place such a case under medical treatment before deciding to operate upon it, for it is most remarkable to witness the immediate shrinkage in these large masses under proper therapy.

After the age of twenty-five many of these large colloid goiters contain small adenomas which may be awakened into activity by the administration of dessicated gland, iodine or thyroxin—so that after the age of twenty-five it is safer to consider these glands in a surgical light should they cause mechanical symptoms.

ADENOMA

It may be assumed that sustained stimulation of the thyroid gland in conjunction with unknown factors will cause the development of new tissue—new groups of acini which cannot be considered normal. Woefler believed them to be of fetal origin. They may be noncapsulated and scattered throughout the gland (diffuse adenomatosis) or the tissue may be encapsulated (the true adenoma). In the fetal type the acini contain no colloid and the cells appear never to have functioned. In some adenomas the acini contain colloid in excess and the new tissue is called colloid adenoma. All stages of development of the acini may be found in adenomatous tissue.

The adenomatous thyroid as a rule will remain in a quiescent period for many years after its appearance but sooner or later will show signs of hyperfunction. Iodine or thyroid feeding will cause these quiescent adenomas to hyperfunction and it is this type of patient who is so frequently harmed by the incorrect use of iodine. Kocher years ago warned against the use of iodine in the treatment of endemic goiter. Endemic goiter in Switzerland is largely adenomatous and it can be readily understood why Kocher took this stand.

It is hard for a surgeon to be conservative when confronted by a young patient with a quiescent adenoma when he knows that sooner or later the adenoma will become toxic, that it may become malignant, and if it should, that it may quickly metastasize to long bones before there is much visible change in size or consistency of the tumor—that it may undergo calcareous degeneration or become substernal or intrathoracic. These are all strong arguments for the surgical removal of all quiescent adenomas, and these operations can be performed with great safety. Let me emphasize that there should be no medical treatment for the non-toxic, quiescent adenoma of the thyroid. Iodine in any form is most harmful.

ADENOMA WITH HYPERFUNCTION

After a long period of quiescence—seventeen and six-tenth years in Plummer's last series—the majority of adenomatous goiter patients will show signs of hyperfunction. Sixty per cent of the adenomas resected recently in the Mayo Clinic in patients over sixty years of age were found to be hyperfunctioning. The onset of the hyperthyroid stage is slow and insidious in contradistinction to the rapid onset of the severe symptoms of exophthalmic goiter. The symptoms for a long time may be mild and the patient not incapacitated by them for years, but slowly and surely cardiac or renal complications will arise which will make serious inroads upon the patient and render the surgical treatment of many of these patients hazardous.

The operative mortality of the surgical treatment of toxic adenoma in the Mayo Clinic until 1925 was 3½ per cent. Since that time it has fallen to 1 per cent—the drop being wholly due to stopping the use of digitalis in the treatment of the patient with auricular fibrillation.

The patient with hyperfunctioning adenoma presents all the symptoms of hyperthyroidism due to an elevation of the rate of energy transformation in the body. The increased heat elimination is shown

by the increased surface temperature and perspiration, loss of weight in spite of the increased food consumption, elevation in the basal metabolic rate; cardiovascular symptoms which indicate an increase of the minute volume flow of blood from the heart, and certain symptoms due to fatigue. All these symptoms of hyperthyroidism may be produced in a normal adult by feeding desiccated thyroid gland or the administration of thyroxin.

The benefit obtained by the surgical removal of these hyperfunctioning adenomas is immediate. The metabolic rate returns to normal within three weeks and the symptoms of the hyperthyroid state disappear promptly.

The effect of iodine upon the adenomatous goiter patient already toxic is an open question. Some observers feel that it benefits the patient, others that it does harm. I have reason to believe that its use aggravates the hyperthyroid symptoms already present and I have seen not a few patients made worse by its employment. The drug should never be given to any toxic adenomatous goiter patient outside a hospital and its administration should be checked by careful chart keeping and metabolic readings.

In analyzing the symptom complex of exophthalmic goiter and differentiating it from adenoma with hyperfunction we notice first that the disease occurs at an earlier period of life, that the symptoms develop suddenly and are severe at the beginning, and the patient comes earlier for examination after the onset. In exophthalmic goiter we have besides all the symptoms of hyperthyroidism seen in adenoma, ocular changes, certain nervous phenomena and the tendency to develop crisis, coma and death, which are wholly wanting in the toxic adenomatous patient. It is these peculiar symptoms just mentioned which Plummer attributes to the presence of the abnormal uniodized presecretion.

The patient with exophthalmic goiter presents a characteristic picture of a mechanism overdriven to the point of exhaustion. The nervous system is in a state of extreme hyper-irritability and the patient subject to the most violent emotional outbreaks. Plummer has compared the intoxication of the exophthalmic goiter to that of acute and chronic alcoholism. There is an ever present complaint of internal nervousness which expresses itself in continuous and purposeless movements. The hands are clasped and unclasped, the legs are crossed and uncrossed, the garments rearranged. The patient asks for air—fans herself violently, walks about the room impatiently; wipes her moist brow, dries her hands—unnecessary movements with no end in view. Quiet repose for even a short space of time seems impossible. When asked to step upon an examining table the whole frame of the patient trembles violently; there is such exhaustion in the severe case that the patient must be assisted upon the table.

If the intoxication is not checked and increases, the patient thrashes about in bed, sleep is impossible, an erythema develops from irritation of bed clothes. A patient in this state may be said to be on the verge of a crisis; delirium, vomiting, diarrhea, coma and death end this distressing picture in many instances.

There is a peculiar stare present which is characteristic of the disease and gives the patient a frightened, haunted appearance. The diagnosis is frequently made at a glance from this symptom alone and the exophthalmos which develops later is no doubt caused by the same factor which produces the stare.

Lugol's Solution

Plummer in 1922 advocated the use of Lugol's solution in exophthalmic goiter to quiet down the storm of acute hyperthyroidism and prepare the patient for operation.

It was but a few years ago that the administration of iodine to an acutely sick exophthalmic goiter patient was strongly warned against, because it was

thought that the disease was due to an excess of the normal product of the thyroid in the body, and it was known that this product contained iodine. The use of iodine as a skin disinfectant, and of iodized catgut, was given up in many clinics. Plummer noticed, however, that the administration of a dose of thyroxin to an exophthalmic goiter patient produced no marked exaggeration of the symptoms, and because of this he reasoned that some of the typical symptoms of exophthalmic goiter, at least, must be due to an abnormal product of the gland lacking iodine. He started to administer Lugol's solution on a very definite theory: that exophthalmic goiter is due to an intensive stimulation of the thyroid under which the gland delivers not only an excess of its normal product, but the abnormal product which is an incompletely iodized thyroxin molecule—and that the symptom complex of exophthalmic goiter varies with the relative amount of the normal and the abnormal uniodized thyroxin molecule, the latter which gives rise to the characteristic eye symptoms and nervous phenomena of exophthalmic goiter and which Lugol's solution has been found to control so well. If the thyroid is well trained to this intensive stimulation, the product of the gland is essentially normal—though in excess, and postoperative deaths are rare in spite of high basal metabolic readings. If the thyroid is not well trained the stimulation produces an excess of the abnormal secretion, and postoperative deaths are common and are due to the reaction that occurs in these patients overloaded with this abnormal product.

It is most astonishing to observe the change that takes place in the condition of the acutely sick exophthalmic goiter patient after the administration of Lugol's solution for six or seven days; to witness the improvement in the nervous system of the patient as the pulse and metabolic rate fall. It is not unusual to prepare patients with a metabolic rate of well over plus sixty and a pulse rate of one hundred and thirty or higher for a safe thyroidectomy after a week of preliminary preparation with Lugol's solution; all of whom, with the former methods of preparation would have had single or multiple ligations with single or double lobectomies performed months after the ligation, the morbidity extending over a year in some instances.

By the use of Lugol's solution the need for ligation has been greatly reduced, and the percentage of ligations has fallen from 50 to 90 per cent in some clinics. Ligations in the writer's opinion should not be entirely abandoned, but held in reserve as a safe measure for the critically sick patient and for the occasional one who does not respond to Lugol's preparation. One frequently sees a case in extremis, deep in the throes of a crisis upon admission, improve so much that operation may be performed safely at the end of two weeks. Before we used the iodine preparation, the treatment of such a case was about as successful as was the treatment of a patient in diabetic coma before we had insulin. When one can operate safely upon such cases now it is extremely difficult not to become enthusiastic over the whole subject. The reluctance which some surgeons have to administer Lugol's solution may be due to the fact that they have witnessed the harm which arises from its incorrect use, or by using it incorrectly themselves in adenomatous goiters. Lugol's solution given to exophalmic goiter patients exactly as Plummer advises greatly reduces the mortality and morbidity of the disease. The writer considers it the most valuable contribution of the many which Plummer has made to the study of this obscure and treacherous disease.

The successful surgical management of the patient seriously ill with hyperthyroidism demands a correct understanding of the disease and the patient. It necessitates treatment in an institution which understands goiter team-play and technique, and by a surgeon and his

assistants who appreciate the value of correctly applied psychology.

Crile's anoci-association technique is a most skillful way to approach the seriously ill goiter patient and the whole plan is a tribute to his splendid genius. We apply it in a measure in our work with great satisfaction and success in that no patient knows exactly when the operation is to be performed. The night before is spent in restful sleep—morphine replacing the accustomary early sterile water hypodermic the morning of the operation. The patient goes to the anesthetizing room believing it to be the metabolism room and ethylene is administered without excitement and often without the patient's knowledge that an operation is about to be performed.

It is argued that this plan is troublesome and unnecessary—that no harm arises in bluntly announcing to the patient that an operation is scheduled for the next morning. My experience makes me believe that no matter how much the operation is desired by the patient, no matter how much she resents the delay of preparation, she cannot accept the news of an oncoming operation without intense emotional excitement.

Local anesthesia has many strong advocates—perhaps not so many as formerly, but apprehension of being hurt, the discomfort of tracheal traction which cannot be obliterated by any type of local anesthesia, the increase in the operating time which local anesthesia requires, all throw a tremendous burden on the patient. This additional cardiac load, so easily avoided by ethylene or nitrous-oxide anesthesia, may be the cause of immediate or remote cardiac breakdown, and the unpleasant experience of a thyroid operation performed under local anesthesia may leave a lasting harmful impression in the patient's mind.

All patients having hyperthyroidism should have private rooms and special nurses whether or not the patients are charity cases. The nurse must have training in the care of goiter patients. Absolute quiet must be maintained and the family and friends must be kept away for the first few days. It is most important that the patient sleep and be kept quiet. Morphine should be given frequently. Allonal works well as an hypnotic. Fluids must be given freely with alkalies either by mouth, by bowel, or subcutaneously. We do not use digitalis preoperatively or postoperatively except for the patient with cardiac decompensation, believing that postoperative fibrillation will usually right itself in a few days in the average case. It is difficult to persuade the younger members of the staff not to give digitalis in such a case.

Iodine (Lugol's solution) should be given immediately after operation and continued during the patient's stay in the hospital and for several weeks at home. Our results have been vastly improved since we adopted this plan of treatment, and morbidity has been greatly lessened.

I agree with Crile in the management of the postoperative rise of temperature, since the rate of metabolism increases approximately ten points for every degree of temperature. Ice packs are used freely to combat it. In the postoperative care of a seriously ill goiter case the surgeon and his associates should proceed with calm assurance and gentleness in care and attention. This attitude is most valuable as a therapeutic aid during the crisis through which some of these patients must pass.

Postoperative hemorrhage, which is fortunately rare, demands the immediate and intelligent attention of the surgeon or one of his qualified assistants. If possible the patient should be transported to the operating room, but if the pressure of the clot is alarming the wound had better be opened in the patient's room, the clot expressed and the hemorrhage controlled later if thought best. The lives of five of my patients have been saved by the prompt action by members of the staff. I am satisfied that all these patients would have been lost had the usual intern staff been confronted with this urgent postoperative emergency.

Careful watching and nursing is necessary not alone to enable one to act promptly in these emergencies which fortunately are not common, but to prevent pneumonia which is frequently seen and is so often fatal. The suggestion of Bartlett to feed these patients who have great difficulty in swallowing, by a retained nasal tube, is a very good one. A great quantity of fluids and nourishment which could not be given otherwise may be taken in this manner during the first few days after operation.

The wound should have the best of surgical attention, for not only is infection badly borne by these patients but the infection may produce enough thyroiditis with destruction of the remaining part of the gland to produce hypothyroidism.

Removal of foci of infection is advisable as soon after operation as is compatible with the patient's strength. This should be after six to eight weeks in the mild case.

If the metabolic rate has not been above plus forty, the patient is young, and the duration of the disease short, it is better not to limit activity for too long a time for fear of causing mental stress. The question is, can we further reduce the morbidity of the mild case of exophthalmic goiter as we have the mortality? Have we not been too solicitous about the young patient with no vascular, hepatic or renal damage, and have we not made chronic invalids of many of them by too strict and too lengthy a postoperative régime? Our patients have apparently done better since we have allowed them to return to partial activity soon after their arrival home. The older patient who shows the effect of prolonged and severe toxemia should, of course, have long periods of rest under strict and intelligent medical supervision.

Discussion

Dr. Willy Meyer: I am sure that every physician and surgeon has followed with interest the evolution of the chapter on goiter in the last twenty-five to thirty years. One cannot help becoming enthusiastic in seeing the advances made, and enthusiasm is the wheel of progress. Every medical man who works enthusiastically helps progress.

We have seen what was formerly only surmised to be the cause of goiter (deficiency of iodine in soil and water) proved definitely to be the cause. And we have witnessed how this has influenced attempts at prophylactic treatment.

Most conspicuous are the achievements of the last five or ten years: the discovery of thyroxin; the use of the basal metabolism with reference to diagnosis and prognosis; the preoperative and postoperative use of Lugol's solution, which in many cases of exophthalmic goiter will do away with the necessity of preliminary ligation of the thyroid arteries; a practical classification of goiter, etc. All of this means tremendous progress of which we may well be proud and enthusiastic.

Naturally, operative technique in goiter operations has greatly advanced. Years ago it was the late Theodor Kocher, chief of the Surgical Clinic of Bern, the originator of the modern technique in operations for goiter, who, on basis of his unlimited material, urged the use of local and regional anesthesia in the surgery of the thyroid gland. He never omitted testing during the operation whether the inferior laryngeal nerve had remained uninjured. Having observed in my own cases and in those of a number of my colleagues the great excitement, even death, of some of the patients afflicted with exophthalmic goiter during operation under local anesthesia and even before the operation had begun, I have often thought that a still safer method might be found in colonic anesthesia, when the patient is brought under the influence of the anesthetic in his own room and while unconscious is carried to the operating room, thus escaping the excitement common under other forms of anesthesia.

I have learned a great deal from the excellent paper of Dr. Guthrie.

Dr. Alexis V. Moschcowitz: Like Dr. Willy Meyer, I also have learned a great deal from the paper of Dr. Guthrie. My only regret is that Dr. Guthrie read this paper before an association of surgeons and not one of general practitioners, because a majority of the surgeons are in accord with what he has said. While there is considerable improvement in New York City at the present time, there still appears to be some diffidence in referring goiter patients to the surgeon for operation. It is only a few years since I paid repeated visits to the out-patient department of Mt. Sinai

Hospital and I found that almost every department except one was treating goiter cases, and surprisingly the exception was the surgical department.

I differ somewhat with Dr. Guthrie in his closing statement, namely, that patients require very definite instructions following discharge after operation. I have purposely made it a rule to give these patients no directions whatsoever and have found in a careful follow-up that they are just as well and perhaps better without any directions. Some of the patients do brilliantly after thyroidectomy, others do not do as well because they retain quite a series of residual symptoms. I believe this is due to the fact that operation has been delayed too long and that whatever does the damage in a case of Graves' disease has done by that time irreparable harm. I mention this merely because I am of the firm opinion that cases of Graves' disease should be operated upon early, before permanent damage has been done.

As for the important question of iodine therapy, I would like to emphasize that I look upon it as the greatest advance in the treatment of Graves' disease and yet it is to be greatly regretted that this boon to therapy has been so freely given out by the Mayo Clinic. I state this advisedly because ever since the publication of this method of therapy, almost every case of any swelling of the neck is treated *ad libitum* with iodine without any good resulting and, I may add, with some harm. It is well to emphasize at this point that the iodine should be used as a preoperative measure.

There is also a slight difference of opinion regarding the question of toxic adenoma. I personally have found that all cases of adenoma which present toxic symptoms also present sufficient evidence in the thyroid gland besides adenomata, namely, hyperplasia. In addition, it has also been my experience that these cases stand the administration of iodine just as well as the non-adenomatous cases of Graves' disease. This has been my opinion for a number of years and I am very glad that Graham and Cutler of Cleveland agree with me in their most recent publications.

Dr. William Barclay Parsons: I would like to express my agreement with Dr. Guthrie and disagreement with Dr. Moschcowitz as to the differentiation between toxic adenoma and exophthalmic goiter. It seems to me that these two groups of cases are separate and distinct. In toxic adenoma there are either single or many masses, the symptoms are slow in developing, and the history is continuous, with gradually increasing severity. These cases do not develop eye signs or gastric symptoms. Now and again one sees a case where an adenoma has been under observation in which the symptoms of exophthalmic goiter appear. The pathologic picture in the gland tissue is usually a characteristic one. In cases of toxic adenoma where the symptoms have not been so severe one does not find in the surrounding glands this characteristic picture.

Beginning last fall, after the publication of Graham and Cutler's paper, we gave to our toxic adenoma cases courses of therapy with Lugol's solution. In some there was no improvement; in another group the symptoms became aggravated and the metabolism lower, whereupon we stopped the Lugol's solution and, in a few, definite improvement occurred. In the exophthalmic group there was enormous and regular improvement under iodine therapy which was very different from the results of treatment in the adenoma group. Jackson speaks of twenty-one as the critical age in which one seems to get satisfactory results with the use of iodine in colloid goiter. He feels that in older individuals this cannot be done. I have that feeling. At first I treated all the individuals with iodine and where I did not get unsatisfactory results I got no results, as far as reduction of mass is concerned. It is quite satisfactory in younger individuals, but in those over twenty-one or so I believe there is real danger of changing a non-toxic into a toxic adenoma. As most of these are multiple adenomata in the colloid stage, and not simple colloid goiter, iodine therapy cannot be expected to help, and it may do harm.

Dr. Charles Gordon Heyd: Most of us have read in the last few years considerable about the goiter problem and its treatment but it is seldom that one finds himself so completely in accord with the essayist as on this occasion. There are a number of points that deserve attention. I think that we will all agree that the measure of a cure after thyroid resection in cases of hyperthyroidism is dependent upon the length of time that the patient has suffered from hyperthyroidism. There is no therapy nor surgical procedure that will correct the permanently damaged heart, or the degenerative changes in the liver, kidneys and brain that are the direct result of long-continued hyperthyroidism. This type of patient repre-

sents an individual who cannot be cured finally and completely by any means at our disposal and the problem of hyperthyroidism is essentially that of early recognition and adequate surgical intervention.

In regard to the anesthesia in cases of Graves' disease we at the Post-Graduate Hospital have become less and less inclined to use local. We have been employing, with increasing success, rectal anesthesia in all of our cases of hyperthyroidism. This anesthesia is administered in the patient's room and the patient falls asleep there and avoids thereby all the nervous excitement otherwise attending a trip to the operating room.

Too much protest cannot be made against the ill-advised use of iodine for the community in general. Iodine has its place in deficient secretions of the thyroid; it has a greatly enlarged place of usefulness as a preoperative measure in Graves' disease; but its use in other conditions is attended with great danger.

Dr. Donald C. Miner (Jersey City): Unfortunately it is becoming all too common to find that exophthalmic goiter patients coming to operation have been thoroughly iodized for prolonged periods. In my experience with such cases the preoperative detoxication process with Lugol's solution for eight to twelve days is thus made relatively ineffective. These patients react to operation as in the days before the use of Lugol's solution though to a less extent. I find that the previous use of iodine is neutralized to a great extent by giving large doses in those cases before and also after operation—in the latter instances as much as half-dram doses a number of times a day until the reaction is controlled.

As to the anesthetic, ethylene has proved to be ideal and has replaced local. When ether is used, gastric lavage will lessen the ether saturation of the patient, as Ochsner advised.

Our reason for failure in surgery of the exophthalmic goiter patient is removal of too little gland or excessive regeneration of the gland. In the latter instance, as Charles Mayo pointed out, small doses of Lugol's solution continued for some time, prevent to a great degree postoperative regeneration and recurrent toxicity.

Dr. Guthrie (closing): I appreciate very much indeed the free discussion the paper has brought out, especially the remarks of Dr. Willy Meyer, whom I have always considered one of the foremost surgeons of the country. I agree with Dr. Moschcowitz and Dr. Heyd that colonic anesthesia is an ideal method for the thyroid patient. I have not used it myself, but one of my colleagues has used the method in many hundred cases successfully. I have always questioned the advisability of giving ether to the seriously sick goiter patient showing a certain amount of cardiac damage. In our hands ethylene works so beautifully that I am satisfied to continue its use.

I am glad it was brought out in the discussion that all this iodine therapy is not due alone to Plummer's work, because I am satified great harm is done by the widespread use of iodized table salt and the tablets put on the market by pharmaceutical houses. In regard to the use of iodine in adenoma with hyperfunction, I have seen some cases in which I was sure that it did distinct harm and others in which benefit was obtained.

In regard to the recurrence following operation referred to by Dr. Miner, I have been amazed to see pronounced hypertrophy take place within a short time even after a great part of the gland has been resected. The long-continued use of Lugol's solution after operation cuts down the percentage of recurrence.

EMBOLIC AND METASTATIC PHENOMENA IN PLEURAL AND PULMONARY INFECTIONS

PAUL W. ASCHNER, M.D.

(Author's abstract)

The association of brain abscess with pulmonary suppuration is well known and commonly referred to as "metastatic" brain abscess. Schorstein collected 69 cases, 38 of which occurred with bronchiectasis and 15 with empyema. The empyema cases were chiefly those of chronic type with persistent sinus long after operation. Of 51 cases of the series 33 presented a solitary brain abscess, of which 25 were in the left cerebral hemisphere. That organs other than the brain may present metastatic abscesses in cases of lung infection is little known. Martius collected 22 cases of brain abscess of pulmonary origin in 6 of which abscesses elsewhere in the body were discovered at

post-mortem examination, in the kidneys, liver, spleen, heart muscle, and ovary.

Following the influenza pandemic of 1918 empyema due to pulmonary disease of various types was frequent. I observed three cases of aseptic cerebral embolism at this time in young individuals with no evidence of cardiac disease to which the emboli might be traceable. All three presented a right hemiparesis or hemiplegia; two recovered completely, in one spasticity of the lower extremity persisted. In the first case hemiparesis occurred two days after drainage of a streptococcus empyema. In the second, left hemiplegia occurred a week after the chest was drained by aspiration. Subsequently a pyopneumothorax and bronchial fistula were proven by operation, indicating that a lung abscess had perforated. Spastic paralysis of the lower extremity was present four years later. In the third an unresolved pneumonia of the right upper lobe was demonstrated by roentgenogram.

It seems reasonable to ascribe the embolic lesions in all three to thrombi in the pulmonary veins in the vicinity of the diseased lung parenchyma. In the third case there was, moreover, embolic occlusion of the right common iliac artery resulting in dry gangrene of the lower leg and foot. The leg was amputated just above the line of demarcation; the arteries in the specimen were not occluded.

Three other cases of embolism of large peripheral arteries were observed. A man aged sixty-four years with infiltrated lung and encapsulated empyema developed embolism of the right brachial artery and symptoms of cerebral embolism, and died. A boy aged eight years with lobar pneumonia and pleural effusion presented the picture of saddle embolus of the aorta. At operation both external iliac arteries were found occluded, the embolus having evidently broken. He died soon after the embolus in the left iliac artery had been extracted. A man forty-one years of age upon whom bronchostomy was performed for lung suppuration developed the signs of saddle embolus. Under observation the embolus apparently broke, one fragment occluding the right common femoral artery, the other the left popliteal artery. He recovered without operation, no gangrene developing. In this group of cases it also seems reasonable to ascribe the emboli to thrombi in the pulmonary venous radicles.

The emboli in all these instances were either aseptic or carried organisms of such low virulence that suppuration did not supervene. The distinction between septic embolism and metastatic infection is one of degree rather than of kind. In the first instance an infected gross thrombus is thrown off into the circulation. If such a thrombus originates in a venous radicle of the greater circulation it will lodge in the lung unless there be a patent foramen ovale. If it originates in the lesser (pulmonary) venous system it will lodge in an artery of the greater circulation, most commonly in the brain. In the second instance (metastatic infection) bacteria, singly or in small clumps are thrown into the circulation either directly or by way of the lymphatics. If the primary infection is in the zone of the systemic circulation these bacteria either lodge in the lungs, or they may filter through the pulmonary capillaries and reenter the general circulation, producing in the former instance miliary lung abscesses and in the latter abscess of the kidney, spleen, bones and joints, or brain. If the primary infection is in the lung, however, such bacterial emboli pass directly from the pulmonary veins to the left auricle and thence into the general circulation. The resulting lesions are known as metastatic abscesses or infections.

Nine instances of such peripheral metastatic suppurative lesions originating from a primary intrathoracic focus have been observed in the surgical wards of the Mount Sinai Hospital since 1918. The pulmonary lesions were pneumonitis, empyema—both recent and old, lung abscess, and bronchiectasis. The metastatic infec-

tions occurred in the soft parts, the joints, the epiphyses and the flat bones. In only one case was bacteremia demonstrated. In only one instance did the metastatic lesion assume the foul character of anaerobic infection so frequent in lung suppuration.

When dealing with brain abscess secondary to pulmonary infections the distinction between embolic and metastatic cerebral suppuration is difficult to maintain not only clinically, but also pathologically. The clinical manifestations of brain abscess are well known and will not be detailed here. Of seven cases suspected only three could be subjected to craniotomy and in two the abscess was found. An observation of clinical importance was made from the review of our cases; namely, embolic phenomena occur especially in those patients who have hemoptysis or postoperative hemorrhage from the lung after pneumotomy for drainage.

A review of the post-mortem records since 1918 was made and the results tabulated:

Eighteen Complete Examinations Including the Brain

Pulmonary lesion	*Pulmonary vein lesion*	*Embolic or metastatic lesions*
1 Lobar pneumonia	None	Purulent encephalitis
1 Bronchopneumonia and empyema	None	Abscesses of kidney
1 Bronchopneumonia and empyema	None	Meningitis
15 Pulmonary suppuration	2 Thrombosis	6 Brain abscess
	1 Phlebitis	1 Infarct of kidney
	1 Arteriovenous aneurysm	1 Abscesses of both kidneys
		1 Gluteal abscess
		1 Sacroiliac joint suppuration

In 43 examinations, complete except for the brain, the following secondary lesions were noted: infarction of spleen, 2; abscesses of kidney, 2; multiple joint infection, 1; peritonitis, 1. In four cases pulmonary vessel lesions were demonstrated: purulent thrombophlebitis, 2; eroded veins in wall of abscess, 1; thrombosis of small artery with infarction at site of exploratory puncture, 1 (sudden death).

In 42 cases only the thoracic viscera were obtained. In four of these thrombosis in pulmonary vein radicles was found. Thus in 98 cases pulmonary vascular lesions were found in 12 instances. A more detailed examination with reference to this point would probably yield a still larger incidence.

The occurrence of convulsions, collapse and even death upon exploratory puncture of the chest, or irrigation of an empyema cavity formerly ascribed to "pleural shock" are now known to be cases of cerebral air embolism. A number of such instances have been observed in our cases. In one case, that of a woman upon whom bronchostomy for post-tonsillectomy lung abscess had been performed three years previously, this bronchostomy was explored for hemorrhage from the tract. She died suddenly 10 minutes after the operation was begun. At autopsy air was found in the heart and in the vessels of the brain.

CONCLUSIONS

The peripheral complications of pulmonary infections may be embolic or metastatic. The embolic complications may be aseptic or septic, and are referable to thrombotic and phlebitic lesions of the pulmonary veins. They may involve not only the brain but arteries of the extremities, kidneys, and spleen. In empyema cases embolic phenomena should be referred to the underlying pulmonary disease and not to the empyema per se. Metastatic infections of soft parts, joints, epiphyses and flat bones, occur in pleural and pulmonary infections, more frequently in empyema and lung suppuration than in simple pneumonitis.

Discussion

Dr. Morris K. Smith: I would like to ask Dr. Aschner if he thinks that postoperative emboli in the general circulation are ordinarily

preceded by an intermediate pulmonary complication. I recall a patient of mine who developed an embolus of the brachial artery following hysterectomy. Yet no signs of lung disease had been noted.

Dr. Walter M. Brickner: A word in this connection concerning metastases from pulmonary actinomycosis. Almost always actinomycosis spreads by contiguity. Occasionally, however, the disease is blood-borne. Instances of this are those rare ones of the pyemic form of the disease, and those also rare cases of actinomycosis of the central nervous system. Excluding meningeal actinomycosis developing by direct extension from facial and vertebral involvements, the reported cases of actinomycosis of the brain, sometimes found as an isolated abscess, are probably always metastatic, although some of them have been reported as primary. In some of these there were but incomplete autopsies. A study of cases in which there were more or less complete histories or autopsies would indicate that many, at least, of the recorded instances of cerebral actinomycosis were metastatic from the lung. It must be remembered that actinomycosis sometimes subsides spontaneously, and thus, rarely, pulmonary actinomycosis recovers under treatment, or by expectoration. In one case of actinomycotic abscess of the brain an "extinct" focus was found post-mortem in the lung.

Dr. Aschner (closing): In reply to Dr. Smith's question about peripheral embolus following abdominal operation, we must assume that there was either a patent foramen ovale, or that there was an unrecognized lung lesion, possibly a silent bronchiectasis which set up a thrombotic process in the lung. Dr. Brickner mentioned actinomycosis of the lung as a possible cause for brain abscess. We recently had a patient in the hospital for an infiltrative pulmonary lesion thought to be neoplastic. At operation a specimen was removed and proved to be inflammatory. The following day nodules in the skin all over the body developed. One of these was removed and sent to the laboratory and on section proved to be an inflammatory lesion containing streptothrix. The patient later came to autopsy and there was found a primary streptothrix infection of the lung and a general dissemination with metastatic lesions in the spleen, kidneys and other organs. The dissemination was probably induced by the trauma incident to the pulmonary exploration.

PRESENTATION OF CASES

END-TO-END ANASTOMOSIS OF THE BRACHIAL ARTERY IN A COMPOUND FRACTURE OF THE HUMERUS

JASON SAMUEL PARKER, M.D.

White Plains, N. Y.

R. L. was admitted to the White Plains Hospital July 15. His left arm had been crushed by an automobile, immediately above the elbow. An area of skin as wide as the tire and half the circumference of the arm was missing. The median and ulnar nerves were exposed but were intact. The biceps and brachialis anticus were completely cut across, the humerus was fractured 3 inches from its lower end and the brachial artery was completely severed. The forearm was blanched, cold, pulseless, and I could have clipped through the crushed triceps and amputated the arm with a few snips of a scissors.

End-to-end suture of the brachial artery, by the Carrel method with silk was performed with some difficulty because the artery 2 inches distal to its division was crushed and had to be sacrificed. To make an approximation the upper end was dissected to the middle of the arm and two branches which I took to be the inferior profunda and anastomotica magna had to be ligated. The fracture could not be reduced because of tension on the sutures. The contused muscle was excised and the ends were sutured. A molded splint was applied.

Convalesence was stormy. The ends of the muscle all sloughed and the lower fragment protruded. Circulation improved, the protruding fragment which had united at an angle was cut off and the wound finally closed. It is interesting to note nature's effort to overcome the deformity. The original scar, 2 by 5 inches, has contracted to about ½ inch by 3 inches. The lower fragment is straightening out and the scar tissue is developing into a sort of a long tendon for the biceps. He has over one-half the normal range of motion at the elbow and has a perfectly good hand. The artery is patent although the contraction of the scar has made the radial pulse more feeble. I am showing him as an example of what may be accomplished by conservative methods.

(No discussion)

RECURRENT THYROGLOSSAL FISTULA

HERBERT WILLY MEYER, M.D.

Mrs. R., 39 years of age, I operated upon in November, 1926, at The Lenox Hill Hospital for recurrent patent thyroglossal duct.

Following a severe cold nine years ago she noticed a swelling in the mid-portion of her neck at the level of the hyoid bone. Local excision of the cyst was performed in New York at that time and after some delay the wound healed. After breaking open again a second operation was performed in Washington, D. C. under local anesthesia. In spite of this operation a third intervention became necessary and the same surgeon who had performed the first operation here in New York, operated again. This time the operation was a very radical one. In November 1925 under general anesthesia the entire fistulous tract was excised from the skin of the neck through into the pharynx. The wound never healed completely and a fistula developed which constantly discharged mucus.

Mrs. R. was referred to me for operation by Dr. F. McKelvey Bell, of New York, who had studied the case carefully. Roentgenograms made by injection of the fistula with bismuth paste showed that there was a tract that passed over the upper border of the hyoid bone into the tongue and there had several ramifications, probably due to the scar tissue caused by the previous operation in 1925. Some of the injected bismuth paste invariably entered the buccal cavity.

In planning the operation, in this instance the fourth surgical intervention for the same trouble, two points seemed essential: first, good exposure; second, total extirpation of the fistulous tract.

Colonic anesthesia was employed in order to have a free operative field without the annoyance of difficult breathing with mucus in the throat, and to be free of anesthetist's appliances and hands about the head and neck. With this type of anesthesia we could expect the patient to be quietly asleep on the operating table. Secondly, a sufficiently long incision was necessary so that all the landmarks of the operating field could be positively and easily identified.

To insure the total excision of the fistulous tract the first precaution taken was an injection of the tract by Dr. Bell on the operating table just before the operation. We used Beck's paste colored with methylene blue. The injection again passed through the duct into the pharynx and so we were certain that the entire tract was filled. If the specimen could be removed without seeing the blue paste at any time during the operation one could be reasonably sure that the operation would prove successful.

The principles followed for the technique of the operation were based upon the publication of Sistrunk of the Mayo Clinic.[1] These were the dissection of the cyst to the hyoid bone, the invariable removal of a portion of the hyoid bone, and then the coring out of the duct with surrounding muscle tissue from the hyoid bone to the foramen cecum of the tongue, passing through the muscles of the tongue. This duct usually lies in the direction of a line dividing the right angle formed by two lines, one dropped perpendicular from the upper anterior border of the hyoid bone in the midline to the cervical spine and the other running horizontal from the hyoid bone upward towards the skull.

Having operated with success on six cases of recurrent thyroglossal duct according to this technique, the same principles were followed in this case with minor modifications.

The old scar with fistulous opening was circumcised and the incision was lengthened to about three inches. The skin and platysma were reflected upwards and downwards until the landmarks could be made out. These were the anterior bellies of both digastric muscles above with the mylohyoid muscle forming the floor of the wound. Below the thyroid cartilage was the landmark, and on either side the hyoid bone with the border of the submaxillary salivary gland. From these landmarks the old hard infiltrated scar tissues were dissected to a point where they were attached to the mid-portion of the hyoid bone. About one centimeter of the mid-portion of the hyoid bone was then removed, attached to the specimen. The scar tissue of the previous operation could then be palpated in the tongue muscles. Knowing the usual direction of the duct, the entire scar tissues in the tongue were then cored out in this direction by cutting in healthy tongue muscle tissue with scissors, passing through the geniohyoid and geniohyoglossus muscles. When at the foramen cecum, which was indentified by introducing one finger into the mouth and

[1] Sistrunk, W. E. Cysts of the thyroglossal tract. *Surg. Clin. N. Am.*, 1921, i, 1509–1513.

another in the depth of the tongue wound, the tract was totally excised by cutting through into the pharynx. At no time during the operation was the blue paste encountered although, after the specimen was removed, it was possible to see the blue paste shimmering through the duct at one point. The depth of the tongue wound was then carefully cauterized with Paquelin cautery for careful hemostasis. The divided tongue structures were repaired by interrupted fine chromicized catgut sutures. A small tampon and gutter drain were introduced into the tongue and brought out between the cut ends of the hyoid bone. The cut ends of the hyoid bone were not approximated, as we had done in some previous cases, but were left alone. This gives better drainage and, I believe, later, freer motion of the tongue. The platysma was sutured with 00 chromicized catgut and the skin closed with interrupted black silk sutures.

The postoperative course was uneventful except that all the chromicized catgut knots in the platysma were extruded, one by one, probably not being absorbed on account of the impoverished blood supply caused by the four operations in one small field.

The operation was performed four months ago, the wound has healed firmly, and I believe we can assure the patient of permanent cure.

The purpose of presenting the case is to impress:

1. The value of colonic anesthesia in these somewhat difficult cases.
2. The value of injecting colored Beck's paste just before operation.
3. The value of operating by clearly identified and dissected landmarks, and removing all old scar tissue.
4. The value of invariably removing a portion of the hyoid bone and then coring out the duct through the tongue muscles into the pharynx at the foramen cecum, thus totally extirpating the entire thyroglossal duct.

Discussion

Dr. F. McKelvey Bell (by invitation): I had the pleasure of seeing Dr. Meyer do this operation and assisted him. When the patient came to see me she had had three operations and still had an exudation of fluid from what appeared to be the remains of a thyroglossal cyst. I thought that if it were merely a sinus and no glandular tissue remained, injections of bismuth paste containing five per cent iodoform might close it. This was tried several times but the clear glandular secretion persisted. Radiograms made half an hour after injection of the paste showed little of the sinus but those made immediately after its injection showed it clearly. It ran over and then dipped behind the hyoid bone passing upward and backward through the base of the tongue. The difficulties of this fourth operation were great due to scar tissue and an irregular channel.

CHOLELITHIASIS WITH ANEMIA, ACHYLIA GASTRICA AND ENLARGED SPLEEN

LEO B. MEYER, M.D.

Mrs. T., aged 43 years, seen first November 25, 1925. Ill five years. Poor appetite, weakness, dyspnea and palpitation, nervousness. No belching, pain, dizziness or headaches. Has had pruritus especially on the inner side of the thighs for ten years.

Physical Examination: Very pale. Weight 130 pounds. Looks like a person with pernicious anemia or carcinoma. Liver palpable. Spleen felt three finger-breadths below the costal margin. Heart, lungs, Wassermann reaction and urine, negative.

Blood Examination: Red blood cells, 3,712,000; hemoglobin, 55 per cent; white blood cells, 3000; polynuclears, 48 per cent; large lymphocytes, 11 per cent; small lymphocytes, 35 per cent; no nucleated red cells or myelocytes. The picture suggested an early pernicious anemia or carcinoma.

Gastric Contents: Total acidity 28 per cent; free hydrochloric acid 14 per cent (subacidity).

Roentgenographic Examination: Negative except for hyperperistalsis.

Treatment: Diet suitable for achylia gastrica with iron and hydrochloric acid.

One month after coming under observation, spleen still palpable, but hemoglobin 70 per cent.

Between January and March 1926 repeated typical attacks of biliary colic. Roentgenograms of biliary tract at that time were negative.

February. Treatment the same except that during attacks received medication for the relief of pain. Spleen smaller. Hemoglobin 78 per cent.

From March to September, 1926, had no attacks and felt well. Spleen no longer palpable. Weight 140 pounds.

September 26. Complete achylia gastrica. This report was confirmed by two subsequent examinations.

October 1, 1926. Attack of biliary colic repeated several times during the month. Roentgenogram of gall bladder at this time showed eight clearly outlined biliary calculi each the size of a large cherry pit. A confirmatory picture taken two weeks later showed only seven calculi. Between the two examinations the patient had had a very severe attack of biliary colic.

November 1, 1926. Operation. Typical cholecystectomy and appendicectomy. The gall bladder contained seven calculi.

December 18. Patient "feels fine." Weight 120 pounds. Hemoglobin 75 per cent. Red blood cells 4,160,000; white blood cells 5700; polynuclears, 59 per cent; and large lymphocytes 9 per cent.

Because of the large spleen and severe anemia with an achylia gastrica which persists, I have suggested that the patient be treated as a case of pernicious anemia. She is therefore on a liver diet and is taking hydrochloric acid, iron and arsenic.

January, 1927 weight 135 pounds. Whether the gall-bladder condition is an intercurrent one or whether it stands in direct causal relation to the patient's condition as it was when first seen, is at present subjudice. This patient presents an interesting study. She has been relieved of a cholelithiasis by operation. Before operation, in fact before any symptoms pointing to cholelithiasis appeared, she presented symptoms of a severe general condition which apparently cleared up before the operation. What this condition was I do not know. Although she is now free of all symptoms I believe the condition for which she first consulted me is still present, but in a remission stage.

(*No discussion*)

LUNG ABSCESS

LOUIS CARP, M.D.

F. A. V., aged forty-two years, salesman, married, white, was admitted to the private pavilion of the Knickerbocker Hospital October 23, 1926, and discharged December 17, 1926. His chief complaint was cough, fever and weakness for four weeks. His past and family histories were irrelevant. Present illness: Six weeks previously the patient had an attack of "flu" in which he had cough, fever, and pains in his extremities. He was in bed at irregular intervals for one week. He then went to business feeling a little weak and he also noticed that he had fever especially at night. He kept on working and walking about with very little cough and no expectoration but he noticed that he had a foul taste in his mouth and his friends called his attention to his foul breath. These symptoms had been especially marked for four weeks before admission and he also noticed that his cough and foulness of breath increased when he lay on his right side. Occasionally a little foul material would be coughed up into his larynx which he would then swallow. One week before, his physician had a roentgenogram made of the chest which showed an area of infiltration in the upper portion of the left lower lobe opposite the fourth and fifth interspaces anteriorly, and eighth and ninth interspaces posteriorly, extending from the left hilum to the axillary region. Two days later a fluid level was sought by roentgenogram in this area of infiltration but it could not be found. A diagnosis of lung abscess was made, nevertheless. I then saw him when he was still ambulatory. He had a foul breath, and was slightly dyspneic, and there were very few signs that could be found in the left chest. Conservative and postural treatment were advised, but the patient persisted in attending to his business and three days later (two days before admission), he suddenly began to have great pain in his left chest especially on breathing. He was prostrated, very short of breath, and he went to bed with a temperature of 105°, and perspired a good deal, especially at night. There had been no chills. He had lost about ten pounds in weight and the pain in his chest had become progressively worse.

Physical examination showed an intelligent middle-aged man, pale, acutely ill, breathing heavily, and in pain. He had a very foul breath. Examination of his chest showed the respiratory excursions on the left side very much diminished, with slight edema over the left chest wall below the axilla. He was very tender over the left seventh and eighth interspaces in the midaxillary line. There was tympany over the left chest especially in the lower half and here the breathing was diminished. Over the left upper lobe posteriorly, there was bronchial breathing. The heart was pushed over to the right about 2 cm. His temperature on admission was 101° which rapidly increased to 104°; pulse 116; respirations 30. It was felt that the patient

had a lung abscess which had ruptured into the pleural cavity and it was deemed wise, considering his condition, to wait for further stabilization of the mediastinum. A roentgenogram of his chest taken two days after admission showed an irregular mottled shadow in the lower half of the left lung field, densest at its lower outer portion. The heart was displaced to the right. There was evidence, therefore, of a small pleural effusion and probably an abscess in the underlying lung. The sputum showed many pus cells, Gram-positive cocci and lanceolate diplococci. There were no tubercle bacilli. His urine showed a very faint trace of albumin.

Operation was decided upon and on October 25, 1926 (two days after admission), under local block and infiltration anesthesia, 3 cm. of the seventh left rib in the posterior axillary line was resected subperiosteally, after aspiration of about 10 c.c. of foul, yellowish pus. About 60 c.c. of foul pus and necrotic tissue were evacuated from a well walled-off cavity which was apparently in the lung and measured about 7 cm. by 5 cm. A large soft tube was inserted into the cavity and surrounded with iodoformized gauze packing. The wound was left wide open and packed with iodoformized gauze.

The patient stood the operation well, but immediately thereafter he became cyanotic and had a pulse of about 120. This, however, gradually disappeared in the course of a few hours but the evening of the operation his temperature went to 105°. He drained large quantities of very foul pus for about three weeks and then the odor was less perceptible. The wound itself was covered with dry, thick exudate of a mouse-gray color which did not bleed and gradually separated in seven days, leaving bright red and bleeding granulations underneath. In seven days he was allowed on the roof in a chair, there was slight cough and the foulness of his breath disappeared. The drainage tube was still left in place. All this time there was distinct evidence of a bronchial fistula. Twenty-five days after operation, the patient had a sudden violent coughing spell in the morning with difficulty in expectoration and without pain. This was the first occurrence of this kind since operation. The bronchial fistula was found to be apparently closed. The next day he had a very profuse foul discharge from the wound and a severe coughing spell, and the bronchial fistula was found open again. Tube drainage was continued. The day after there was only slight cough without expectoration, there was less discharge and the fistula was apparently closed and stayed closed until he became entirely well. It is significant that for about two weeks after the closure of his bronchial fistula he had irregular high temperature, cough, and a foul odor to his slight expectoration. His drainage tube was removed after having been gradually shortened, forty days after operation. He was discharged well with the wound practically closed and with no cough or pain in the chest fifty-three days after operation.

Reexamined on February 7, 1927, about seven weeks after discharge from the hospital, he had gained his original weight, had no cough or pain in the chest, but still felt a little weak. Examination of the chest shows slightly diminished breathing at the left base and a roentgenogram shows at the left base a dense shadow, probably scar tissue in the lung and pleura. The left diaphragm is slightly elevated and shows diminished mobility. There is compensatory emphysema on the right side.

The interesting points in this case are:

1. A probable central pneumonia with a metapneumonic lung abscess which apparently developed in two weeks.
2. The roentgenograms showing, first an abscess in the lung proper and subsequently a rupture of this abscess into the pleural cavity.
3. The pyopneumothorax which made the patient so sick two days before admission and despite which he was operated on two days later giving the mediastinum a chance for stabilization.
4. As soon as the abscess was entered the patient was turned on the affected side in order to prevent aspiration of pus into the healthy lung tissue.
5. The immediate postoperative shock.
6. The foul profuse discharge and mouse-gray color of the exudate in the wound (probably caused by symbiotic aerobic and anaerobic bacteria). This exudate gradually came away in seven days leaving bright red and bleeding granulations underneath.
7. The bronchial fistula was apparently closed in twenty-five days and it was accompanied by sudden, severe coughing spells and foul expectoration (not present since operation).
8. Patient discharged well fifty-three days after operation.
9. A ten weeks' follow-up shows him in good condition with some thickening at the left base.

(*No discussion*)

RUPTURE OF METAPNEUMONIC EMPYEMA INTO BRONCHUS

LOUIS CARP, M.D.

E. N., aged 48 years, female, was admitted to the private pavilion of the Knickerbocker Hospital March 16, 1926, and discharged April 7, 1926. Her chief complaint was weakness and pain under the right breast of two months' duration and foul expectoration of three weeks' duration. She had always been well when three months before she caught cold and coughed for two weeks. She then developed severe pain in the right chest and two days later a diagnosis of right lower lobe pneumonia was made. This condition lasted about two weeks. About six weeks ago she was ambulatory, went outdoors, and began to get stronger. A slight cough and her shortness of breath persisted, however, with no marked temperature until four weeks ago when it began to rise to 101°F. at night. She had pain in the right chest anteriorly which was especially marked at night. About three weeks ago she began to expectorate large amounts of very foul mucopurulent material which was more marked when she lay on her left side. One day before admission her physician aspirated the right chest in the seventh interspace in the midscapular line and withdrew about 10 ounces of thick, yellowish pus which contained a pneumococcus. This gave her slight relief. She has become very pale, has lost weight and strength; her appetite is very poor.

Physical Examination: Patient looks chronically ill and has a waxy complexion. Respirations 26; pulse 104; temperature 101°F. Her pharynx is congested, tongue coated, teeth and lips dry. The right chest moves only slightly with respiration and there is dullness to flatness from the spine of the scapula to the extreme base. The breath sounds and whispered voice are greatly diminished to absent. The heart is pushed over to the left about 2 cm. but its sounds are good and clear and there are no murmurs. The rest of the physical examination is negative. A roentgen-ray examination of the chest showed a sharply circumscribed, dense, circular shadow which occupied the major portion of the lower right lung field, and about this shadow the lung field was poorly illuminated. Roentgenography by the double exposure method showed this shadow to be equally distant from anterior and posterior chest walls.

It was felt that the patient might have a metapneumonic lung abscess which had ruptured into the pleural cavity, but the fact that the pus which was aspirated by her physician was not foul and contained a pneumococcus favored rather a rupture of an empyema into a bronchus. Immediate operation was decided upon and under novocaine infiltration and block anesthesia, a 6 cm. incision was made over the eighth rib in the right midscapular line and a subperiosteal resection of 2½ cm. of this rib was performed. About 32 ounces of thick, yellowish pus without a foul odor and containing large flakes of fibrin were evacuated from a cavity which was well encapsulated and which apparently communicated with a bronchus. This cavity was explored with the finger very gently but no further manipulation was attempted. A large soft tube was placed in the cavity and this was surrounded by iodoformized gauze packings. The patient stood the operation very well and was quite comfortable. There was a profuse discharge from the wound.

The day of operation, her foul expectoration practically stopped. On the fifth day postoperative she was out of bed in a chair on the roof but she still had a very profuse discharge. Her color was much better and she had much less perspiration. On the eleventh day she was allowed to walk and a smaller tube was inserted into the cavity. She complained of a "carbolic" taste when she coughed. This was probably due to the iodoform packing in her wound. The eighteenth day after her operation she had only a very slight discharge and she was walking about easily, felt fine, and was putting on weight. Three weeks after operation she was discharged with a small tube in a small cavity which still, however, communicated with the bronchus. I do not know just when the bronchial fistula was completely closed, but about two and one-half months after discharge she required no more dressings. She has no cough, feels strong, is back to work as a bookkeeper and has no complaints. A roentgenogram taken about eleven months after her discharge from the hospital shows a very slight patch of clouding at the lower and outer portion of the right lung field and the ends of the resected rib are forming a bony bridge. There is a well-healed 6 cm. scar over the eighth rib in the right posterior axillary line and there is slightly diminished breathing at the right base.

(No discussion)

TRANSACTIONS OF THE SECTION OF
ORTHOPEDIC SURGERY
NEW YORK ACADEMY OF MEDICINE

Meeting of April 15, 1927

THE CHAIRMAN, DR. HARRY FINKELSTEIN, PRESIDING

IS GENERALIZED OSTEITIS FIBROSA (PAGET AND VON RECKLINGHAUSEN) CONGENITAL?

I. SETH HIRSCH, M.D.

NEW YORK

PAGET'S name is connected with osteitis deformans, von Recklinghausen's with osteitis fibrosa. The pathological processes are, however, fundamentally similar. These two conditions have in common a disturbance of bone tissue equilibrium which regulates the relation between normal bone removal and new bone formation. This disturbance leads to bone softening, malacia. Between these two diseases there are many transitional stages, so that von Recklinghausen, who includes both in the group of metaplastic malacias ("metaplastic" conveying the idea that the underlying process involves a complete reconstruction), calls Paget's form a hyperostotic metaplastic malacia, and osteitis fibrosa a simple metaplastic malacia.

A study of generalized osteitis fibrosa would indicate that the disease may begin as a simple metaplastic malacia, hyperplastic malacia, or phlegmatoplastic malacia.

The bone changes in fully developed Paget's disease are by no means uniform. In most of the cases there is both porosity and sclerosis of the cortex and cancellated bone, and the marrow may be both fibrous or fibro-osteoid. The constant change is the softening produced by resorption and fibro-osteoid tissue substitution, with resulting deformity. Later this osteoid tissue becomes calcified and the new bone formed in old and new trabeculae and under the periosteum is responsible for the sclerosis, hyperplastic changes and eburnation. With the von Recklinghausen type, cyst formation is common, with the Paget type, relatively rare.

Paget considered the disease one of middle life. Packard, Steele and Kirkbride in a study of 51 cases found the average age to be forty-nine and one-half years. The youngest in their series was that of a patient of Moizard and Bourges in whom the disease seems in their opinion to have quite definitely started at the age of twenty-one.

The age of onset as given in the majority of cases reported is usually in the fourth or fifth decade. Stilling reported three cases in which the patients were seventy, seventy-seven, and ninety-two years old.

Instances of involvement at early age have been reported, however. A survey of the literature makes it evident that well-marked examples of the disease have been found from childhood to extreme old age, and that in a number the markings of the

disease as judged by gross deformities were apparent at birth.

Further, if the histories of the reported cases are studied, it will be found that the given period of onset is based on the phenomena, pain, disability and gross deformity. It is obvious that the disease is a slow, insidiously progressive bony change generally symptomless in its development, that it must take a definite number of years to develop and that before the patient's attention is called to it, the most striking changes have already taken place.

Fig. 1. Boy of sixteen with generalized osteitis fibrosa.

The error of judging the period of onset by the subjective manifestations or on the basis of deformity is therefore apparent.

Hence if we are to arrive at a correct idea of the time of onset it would be important to know how long in the average case it takes for the disease to develop its definite bony changes. These studies can be made only roentgenologically for no correct information on this point can be drawn from subjective and objective criteria. It would be necessary to have a roentgenological record of the incipient changes and to study the case until the disease is in its fully developed stage. Such records have not been made consistently, but when made they tend to indicate that the period of onset must be in the earliest period of life.

In the following case of generalized osteitis fibrosa, the patient was studied over a period of fifteen years.

H. W., male, aged eight years, born in the United States, of Russian parents. His mother had died of rheumatism. The patient had three attacks of diphtheria, one of which was followed by a diphtheritic paralysis of the pharynx, with subsequent recovery. He had attended the public school and was always able to keep up with his classmates in his studies. He was bright and wide awake. He was somewhat undersized and undeveloped for his age and poorly nourished, although there were no complaints whatsoever relating to his general health.

At the age of eight years he first noticed a slight protuberance over the right parietal bone and four years later a similar protusion developed over the left cheek. Both of these protusions increased in size very slowly and with the exception of the deformity to which they gave rise, they caused no complaint. His head had been increasing in size since the age of eight. The roentgen-ray report of the entire osseous system at the age of sixteen was as follows:

The characteristic finding seems to be a combination of a hyperplastic and porotic change. The cortical thickening seems to ensheath the bone and is, as a rule, not through to the entire shaft but is confined to localized areas, usually in the middle portion. This and the flaring of the juxto-epiphyseal ends give the long bones the form of truncated cones. This is especially noticeable in the phalanges and metacarpal bones. The epiphyses are apparently well formed, though the ossifying border seems to show as a line of unusual bone density. The epiphyseal line itself is irregular. The bones of the hands illustrate every variety of lesion, the middle metacarpal bones showing the cortical thickening and deformity, the proximal phalanx of the middle finger showing the cystic formation, while the middle phalanx shows evidence of cystic formation, with intervening ridges of increased bone density. The fifth metacarpal bone of the left hand shows the beginning formation of a large cyst and a small multilocular one is visible in the base of the second metacarpal bone. The terminal

tufts of the phalanges seem to be poorly developed, in marked contrast to the hands of acromegalics.

The upper ends of the tibia show evidence of cortical thickening, while the lower ends show evidence of cystic formation. Large, multilocular cysts are visible in the ossa calcis, while the peculiar bowing, with irregular cyst formation and some thickening of the cortex, characterizes the condition of the fifth metatarsal bone.

On the whole, epiphyseal formation seems to be somewhat delayed. The patient was seen at varying intervals until three years ago. All

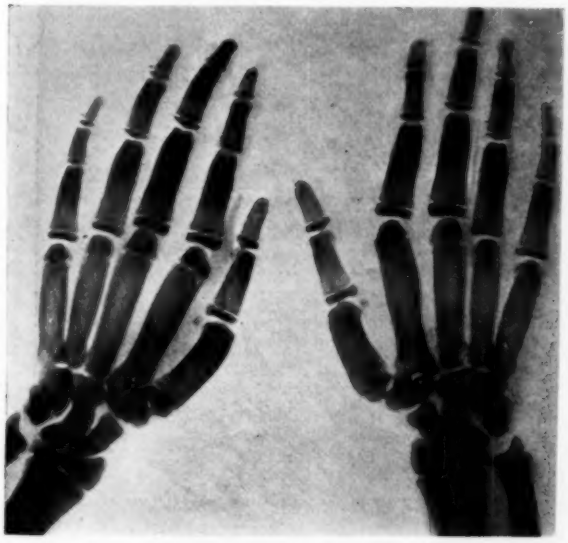

Fig. 2. Roentgenogram of hands showing lesions in metacarpals and phalanges.

characteristic changes are now present in long bones and skull. There was a fracture of the femur, which united firmly. The Wassermann reaction was repeatedly negative.

Von Recklinghausen described this type of generalized osteitis fibrosa as a simple metaplastic malacia found usually in young adults, the course of which is chronic, giving a clinical picture with few symptoms, except the frequency of spontaneous fracture. The primary and essential pathological changes are: (1) a fibrous transformation of the bone marrow which extends into the canals of the Haversian system and results in (2) a local destruction of osseous tissue, (3) parallel with this a new formation of osteoid tissue, (4) cysts occur through hemorrhages or through resorption of bone or myxomatous changes in the fibrous tissue. The special points to be noted in this description are the fibrous transformation of the bone marrow with formation of new bone, and the early rarefaction of the cortex which may be reduced to a thin shell of bone or entirely replaced by fibrous tissue, and that both the simple metaplastic and the hyperostotic metaplastic lesions were already present as early as the age of eight years.

Fig. 3. Femur showing bending of neck due to softening resulting from osteitis fibrosa.

There are other cases in the literature in which at this age or younger a localized lesion, a protuberance in the facial or skull bones, directed attention to the disease which gradually progressed to complete and general bone involvement.

In a case reported by Stack,[1] the remarkable specimens of which are in the Bristol Museum, the skull attained a thickness of three inches; the patient was a female aged twenty-one years. The enlargement of the head was first noted at

[1] Stack, *Bristol M. & S. J.*, 1900.

seven years. The changes of osteitis fibrosa were not limited to the skull but the femora, pelvis and right tibia were involved. It is inconceivable that even under such circumstances the head deformity could have sprung into existence suddenly. It is logical to believe that it was several years before the bone changes attained sufficient prominence to attract attention.

The period of clinical latency, the periods of apparent inactivity and the gradual development of the changes when the disease is progressive, would tend to bring the time of onset back to the earliest periods of childhood. There is another factor which tends to support this. If the photographs of an individual with this disease are studied certain stigmata of the disease may often be noticeable in the shape of the head, conformation of features, low position of the ears, or in the peculiar bowing of the legs, as far back as such photographs are obtainable, even into childhood. A certain squareness of the frontal area or an assymmetry can be noted either in the frontal or parietal areas. In many of the cases discovered accidentally, when the patient is questioned regarding a bowed leg, or arm, or a prominence of the frontal or occipital area, he states that it has been present always but no significance has been attached to it. The early origin of the disease may be inferred from another consideration. Paget himself said in 1889 after he had seen 23 cases, "I have tried in vain to trace any inherited tendencies to the disease, I have not found it in two members of the same family." But since that time many cases of more than one in a family have been reported.

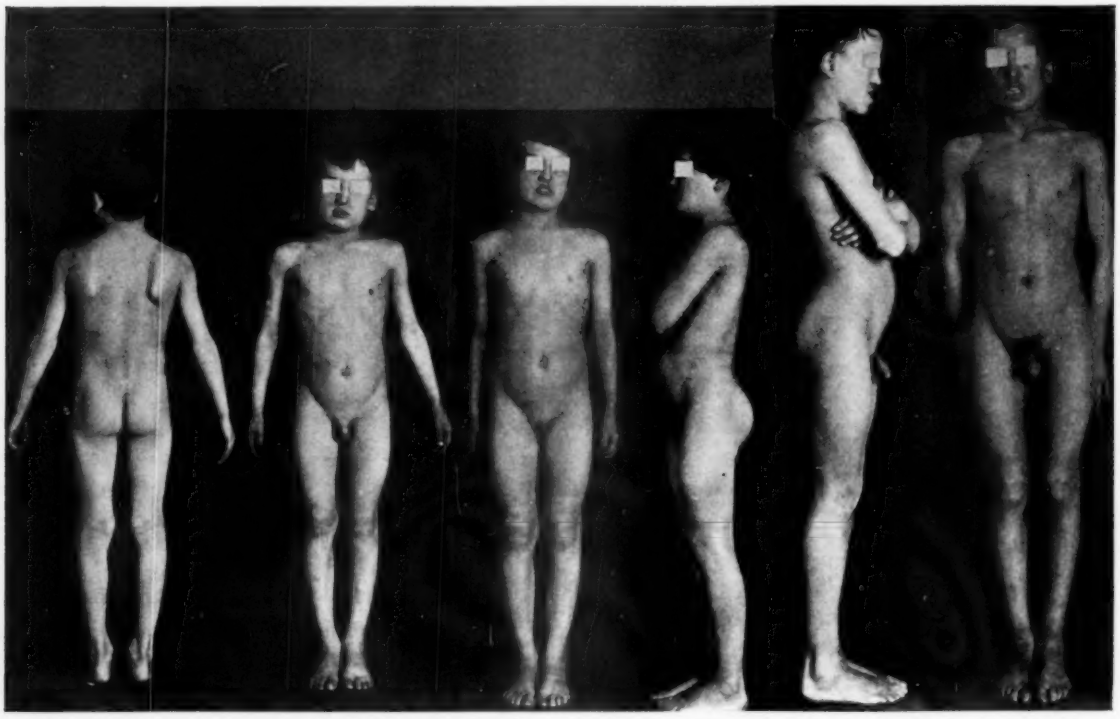

Fig. 4. Photographs of three children in one family with generalized osteitis fibrosa, sclerotic lesions predominating.

A re-examination of the data in the literature and my own observations lead me to the conclusion that heredity exerts a striking and important influence in development of the disease. I have seen cases of father and son, and mother and daughter in adults, and I shall here recite the records of three children, two boys and a girl in a family of nine children, with the early changes of generalized

osteitis fibrosa in their earliest stages. The children are now nine, eleven, and sixteen, and when I first saw them two years ago they showed practically the same lesions as are now present. In two years the lesions have not changed to any marked degree.

The father of the children is forty-four years old, was born in Italy and is a mason by occupation. The mother, also born in Italy, died of nephritis five years ago at the age of forty-two years. They have lived in this country

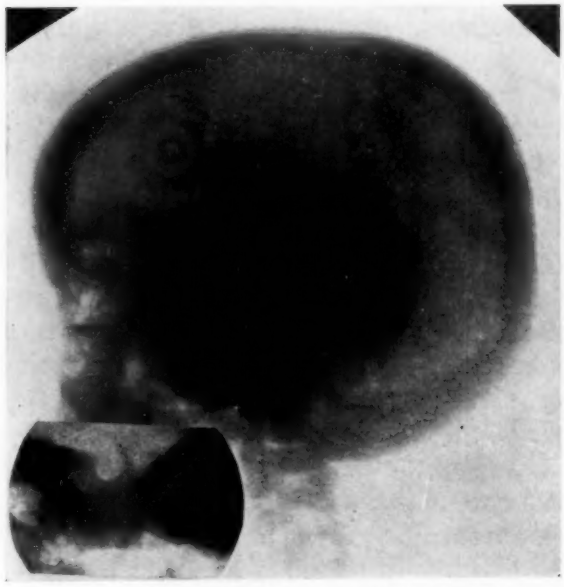

Fig. 5. Skull of Carmella showing thickening of bones with obliteration of diploic layer.
Insert shows thickening of the base of the skull, the sella not involved, the clinoids sharp.

fifteen years. They had nine children, eight of whom are living, and three of them have the disease.

The eldest, Ralph, is now sixteen years old. As far as known, pregnancy and delivery were normal. He was a full-term baby. His fingers were webbed from the time of his birth. He began to walk at one year and to talk at two years. He was nearly a year old when he started to have spasms. He continued to have them about once a year, until the age of eleven years. He had pneumonia when he was two years old, and was quite ill. Had had no other illnesses. Wassermann reaction negative. Physical examination shows: defective speech; slight webbing of the fingers; contraction of fingers; coarse, heavy-set features; mouth kept open; beads of perspiration on nose and upper lip; square head, cranial nerves intact; heart, lungs and abdominal viscera negative; superficial and deep reflexes intact; station and gait good; ears prominent and large.

Tony, is nine years and nine months old. Pregnancy and delivery were normal. No difficulty was noted until he was about a year old, when he started having spasms; he continues to have them; he has had at least one a year, the last one came about six months ago; these spasms start and end within a week,

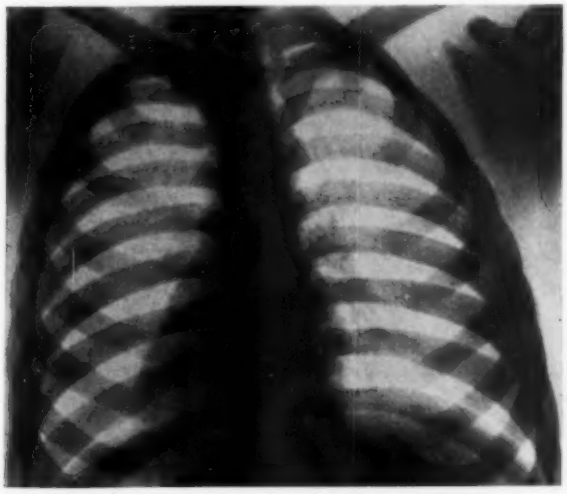

Fig. 6. Chest of Carmella showing lesions in ribs. Thickening of lamellae. Clavicles and spine involved.

that is, the face is out of shape about this length of time. They may come on during the night with no known cause. This child is never unconscious. There are no indications of the difficulty other than facial expression. His speech is also defective. Previous illnesses none. Physical examination shows: square head; heavy-set features; teeth irregularly developed; no paralysis or atrophies; cranial nerves intact; heart, lungs, and abdominal viscera negative; superficial and deep reflexes intact; gait good; well developed, well nourished, good musculature. Wassermann reaction negative.

Carmella, is eleven years and seven months old. Apparently normal at birth. Pregnancy and delivery were normal. Her fingers are webbed. She started to have spasms at the age of ten or twelve months. She had them about every six months or every year until about two years of age. These were characterized by twitchings and spasm without unconsciousness.

She had no other illnesses. Physical examination: coarse, heavy-set features; webbed fingers, marked on left hand; fingers of left hand bent; notched teeth; speech defective; cranial nerves intact; no paralysis or atrophies; heart, lungs and abdominal viscera negative; superficial and deep reflexes intact; gait good. Wassermann reaction negative.

The bones in all these children show similar changes. There is slight bowing of the long bones. The cortex is symmetrically thickened, while the medulla is widened and the cancellated tissue shows an increased calcium deposit. The entire skull and facial bones are thickened so that the diploic layer cannot be seen. The vascular grooves are deepened. There is a tendency towards flattening and broadening of the diaphyseal ends at the epiphyseal lines which gives the metacarpals and phalanges the shape of cones. These are minute localized "cystic areas" in the cortex. The skull thickening is general and fairly symmetrical. The predominating change in the bones is a hyperplastic process with thickened cortex and enlarged diaphyseal ends. It is apparent that the balance between growth of the osteoid tissue and ossification is as yet maintained though small cyst-like areas are just appearing.

There are other instances of several members in one family showing the changes of this disease reported by White, Lunn, Higbee and Ellis, Smith, Chauffard, Berger, Kilner, Robinson, Pick, Parry, Abbe, etc.

The cases reported are by no means an indication of the actual rôle which heredity plays in this disease for many of the family histories are not given or are incomplete in the numerous reported cases. The story of the patient is of no value. It is essential to examine all the members of a family. For to the patient, deformities of the disease may pass merely as a familial resemblance. The determination of this point must be based on roentgen examination which is the only positive test. Absence of the disease in other members of the family cannot be accepted according to modern criteria unless a roentgen-ray examination has been made—a point on which I have been able to convince myself by an examination of the bones of the son of a patient who was considered normal and in whom I found evidence of the disease. I believe that when the families of patients with Paget's disease are submitted to roentgen examination, this hereditary tendency will be established by a large number of instances. It is important to remember that the transmission of this disease is subject to all the laws, exceptions and modifications of hereditary diseases. Such a theory would also explain the presence of the typical changes in but a single bone. If the disease shows this marked hereditary tendency and in the many cases the lesion already exists in infancy or early childhood, it is logical to infer that the affection is either a congenital hereditary disease due to defective osteoblastic activity.

The most logical and workable hypothesis is that the disease is due to a disorder of bone metabolism probably dependent on absence or perversion of some internal secretion. There is much evidence on hand to prove that disorders of the ductless glands do influence bone metabolism. The association of acromegaly and gigantism with disease of the pituitary gland and the osseous lesions of cretinism are familiar examples. Changes in these ductless glands have been reported in many cases of osteitis fibrosa, although findings have not been confined to one gland.

The close parallelism between the mineral metabolism of a growing child, a case after partial parathyroidectomy and a case of osteitis deformans was shown by DaCosta who suggested that this depends in some way, either on the absence or on the perversion of some internal secretion, possibly the parathyroids. The studies of MacCallum and Voegtlin have demonstrated the importance of parathyroids in controlling calcium metabolism.

They regulate the metabolism of calcium just as the pancreas regulates that of glucose. According to this theory the parathyroids have an inhibitory action on the excretion of calcium. An increased elimination of calcium resulting in an impoverishment of the tissues and an increased excitability of the nerves, follows parathyroidectomy, or an insufficiency or perversion of the secretion of the parathyroids. Under these conditions, it is supposed that substances arise which can combine with the calcium and abstract it from the body tissues, or to put in another way, there is a disturbance of the specific activity of the bone cell whereby control of calcium content is lost, this being the first step in production of the disease. The bone cell—a highly specialized and differentiated structure—is the key to the problem. It controls the metabolic activities of an area of bone. As long as its nutrition is sufficient it regulates metabolic exchange of lime salts. It may exercise this function by virtue of a supply of hormone from the parathyroid. If, due to substances circulating in the blood, this sensitive cell is damaged, it loses its control over the adsorbed lime salts. The disturbances of this control leading to halisteresis may with the growth of connective tissues be the essential steps in producing changes of generalized osteitis fibrosa and deformans. There is more post-mortem evidence in favor of a decreased thyroid-parathyroid action being causal than there is for any other factor while metabolic studies of osteitis deformans show a greater similarity to that after thyroparathyroidectomy, than to that of most other disturbances of calcium metabolism.

Recent experimental work tends to support the view that the parathyroids neutralize in some way certain toxic substances formed in the body. The effect of parathyroidectomy is to produce an extreme excitability of the central nervous system and to result in tetany. The presence of tetanic spasms in children showing changes of generalized osteitis fibrosa would favor the theory of parathyroid deficiency as a causal factor. The three children here reported showed paroxysms which suggested tetany. Hypoplasia of the parathyroids could, according to Escherich, suffice to produce tetany, and such a state of the parathyroids would be likely to have hereditary features. A parathyroid hypoplasia would account for chronic cases and compensation with hyperplasia would eventually follow. Parathyroid hyperplasia has been shown in osteomalacia (Erdheim, Schmorl, Hohlbaum), in rickets (Erdheim, Ritter), hyperplasia and tumor formation in osteitis fibrosa and deformans (Maresch, Dawson and Struthers, Meyer, Todyo, and Askanazy). The importance of calcium in the growth of the tissues is shown by the great demands made by the developing embryo on the mother for a supply of calcium. Parathyroid deficiency in the mother might produce changes in the bones of the fetus. Association of chronic renal disease with changes in the parathyroids has been frequently noted (Massagha, Quadi, Manca). The mother of the three children reported died of nephritis.

It must be admitted, however, that as yet it is difficult to formulate any exact deductions regarding the physiological rôle and pathological influence of the parathyroids in normal or abnormal calcium metabolism but sufficient evidence has accumulated to indicate that parathyroid disease plays a most important rôle in production of the bone lesions above described.

CONCLUSIONS

The lesions of osteitis fibrosa are the essential features of the generalized bone disease described both by von Recklinghausen and by Paget. The disease has until now been considered to be characteristic of adults, but experience and a critical review of the literature would show that these bone changes may be present at any age and that stigmata of

the disease already exist in infancy. The varying lesions as found in early life may terminate in the characteristic picture described by Paget.

The disease is probably congenital with strong hereditary tendencies. Parathyroid lesions are associated with the bone changes and congenital hypoplasia might account for the disease.

I apologize for the sketchy and inconclusive nature of the data presented. I fear I have dogmatized too much on insufficient premises, and I appreciate clearly that more clinical, roentgenological and pathological evidence is necessary to prove conclusively the points I have tried to make, but I hope I have at least asked a pertinent question.

Discussion

Dr. Leon T. LeWald: The question has been raised previously as to certain recognized conditions in childhood being antecedent to adult Paget's disease. I am not quite certain that Dr. Hirsch's connecting links of the three children in one family is sufficient proof of his contention. Deposits of lime salts *without* rarefaction are not considered characteristic of Paget's disease, which would make one feel like classifying his cases as some other process in the osseous system. I quite agree with Dr. Hirsch that these cases and true Paget's disease are probably related and are of endocrine origin. At one time I advocated the theory that Paget's disease was of pituitary origin, a sort of opposite of acromegaly, and I still believe that endocrinology explains the etiology better than any other theory. I have studied 48 cases of Paget's disease. In one case the patient when about nineteen had a photograph of himself which showed no bowing. The earliest case of Paget's disease I have seen developed between twenty-five and thirty years of age. I had the opportunity to examine the two brothers reported by Dr. Abbe; they are the only ones of which I have records in one family. I could not elicit a history in any case of father and son or mother and daughter. Dr. Hirsch did not discuss changes in the arterial system; that always comes to the front in a discussion on Paget's disease. The cases shown here look to me like cases of so-called "marble bones." There have been a number of cases of that kind described in this country and abroad.

Dr. Robert E. Humphries: During the past three years we have been studying Paget's disease at the New Jersey Orthopedic Hospital in Orange. At present we have 12 cases under treatment. I am not at liberty at this time to say what this treatment is as there is still much work to be done before we are willing to say we have discovered a cure. Certain conclusions, however, can be reasonably deducted from the work to date. Regeneration of the bones takes place, the cortex becoming clear and well-defined in outline, degenerative areas in the cortex disappear, the medullary cavity becoming smaller, the entire bone decreasing in diameter from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch a year. All cases under treatment so far have responded. Pain has been almost immediately relieved, deformity has automatically corrected itself. From the work we have done to date I should say Paget's disease is not congenital, and is not caused by a disease of any one ductless gland, but is rather due to disturbance caused by intestinal toxemia.

Dr. Sigmund Epstein: I have never seen a case of near-Paget's disease in little children, and I do not find parathyroid treatment of any benefit whatever in this affection.

Dr. Eugene H. Eising: Dr. Hirsch has shown us pictures of a dense proliferative osteitis of the small bones of the hands and feet in children. He asks us to believe with him that these represent early cases of Paget's disease.

He offers no corroborative evidence that these cases are Paget's disease. I would hesitate to make the diagnosis, unless there was some evidence in the tibia, pelvis or skull.

I am inclined to believe with Dr. LeWald that the condition represented is not Paget's disease and that time will prove these cases to be some other condition.

I feel that Dr. Hirsch's question remains still unanswered.

Dr. Maurice M. Pomeranz (by invitation): Dr. Hirsch's question seems to me to be an exceedingly astute speculation. Few of us have the opportunity to study our cases over such a long period. Certainly it would be difficult to refute his point with the evidence he has presented. Would he then classify von Recklinghausen's disease as a juvenile Paget's disease?

The plates Dr. Hirsch presents show no striations or cystic changes characteristic of Paget's disease. Although I have never seen a case of "marble bones," I am nevertheless familiar with the literature on the subject and I would like Dr. Hirsch to give us the differential diagnosis between juvenile Paget's disease and "marble bones."

Dr. Hirsch (closing): My paper concerned itself with but one phase of the disease, the consideration of its etiology. I did not enter into details of the other features of the disease. There has been much confusion in diagnosis of these dystrophies arising out of the desire of investigators to create entities not warranted by pathology. That is why the work of von Recklinghausen on the various types of the malacias and their significance is so important and fundamental. Its value lies in that he attempts to make some order out of chaos. There is a disease, generalized osteitis fibrosa, and there are two forms of it, one described by Paget and one by von Recklinghausen. Paget's disease moves through various stages and there is the marked difference between the appearance of the bones in the incipient case in childhood or infancy and in the finished adult case. The bone changes in Paget's disease are by no means uniform. But this appears to be certain, that osteitis fibrosa and the changes of Paget's disease are histologically identical. The roentgenologist is able to arrange these bone lesions in some sort of sequence, extending from the earliest to the latest advanced lesion. In the roentgenological study lies the key to the problems I have discussed. Parathyroid therapy may be of no value whatsoever in these cases, but that does not prove that the parathyroids are not associated in some way with the disease.

The three cases I have shown in one family, and the boy I studied for fifteen years, exemplify two forms which generalized osteitis fibrosa may assume. I have seen still a third form in which the typical changes of osteitis fibrosa with cyst formations are localized to the diaphyses of the long bones and in the skull. The juxta-epiphyseal ends remained normal. In the cases I described the proliferative changes were present in all the long bones and in the skull and pelvis. The so-called osteopetrosis or "marble bones" is quite another bone lesion and is readily distinguished from osteitis fibrosa by anyone who has had any experience with these dystrophies. In osteopetrosis the diaphysis and the metaphysis have a homogenous density without differentiation of the cortex, spongiosa or the medullary canal. There are encircling bands of lime salts parallel to the epiphysis. The whole bone is changed into a compact structureless mass. The sella turcica is deformed, diminished in size, and the clinoids are thickened, clubbed and enlarged. No such changes are present in the cases I have described.

REGIONAL ANESTHESIA
FOR ORTHOPEDIC OPERATIONS UPON THE SPINAL COLUMN*

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THE principles involved in the induction of regional anesthesia for orthopedic operations upon the spinal column are, to a certain extent, different from those underlying the injection technique for operations on the other parts of the body. Injections are here, as a rule, made in regions in which the landmarks have been more or less distorted by trauma or disease.

In certain pathological conditions, the normal aspect of the spine is not only altered in the affected segment, but the entire height of the vertebral structure reacts to the partial static deficiency by compensatory displacements. Distortions vary not only with the type of lesions, but also with the level of the spine at which it occurs. Compensatory curves are established which occasionally lead to angular deformities. In certain lateral curvatures the spine is twisted; the vertebrae and ribs, drawn in this rotatory excursion, assume abnormal directions and relationships. The position of the patient on the operating table not infrequently adds another element to these anatomical distortions. Tenderness of the region occasionally makes palpation difficult and definition of the landmarks inaccurate. The soft parts and the bony framework lose their normal relationships and the success of the anesthetic procedure depends mostly upon interpretation and visualization. Correct interpretation is based upon careful analysis of the features presented by the roentgen-ray pictures of the pathological areas and their adjacent territories. Accurate visualization rests upon a thorough knowledge of anatomy and the ability to see, so to speak, through the overlying fleshy parts, the structural alterations resulting from the traumatic or pathological disturbances under consideration.

ANATOMICAL EXCURSION

In the *cervical region* in man, the number of vertebrae is almost invariable, but the curve of the cervical column and the occipito-cervical angle vary greatly in different individuals. The thickness of the soft structures of the back of the neck, beneath which landmarks are deeply buried, is ordinarily greatest at the level of the first two vertebrae, the atlas and the axis. Atlas and axis differ markedly from each other and from the remaining cervical vertebrae, not only in their respective morphology, but in the topographic relationship which they bear to each other and to neighboring structures.

The atlas is composed of two lateral masses connected anteriorly and posteriorly by two arches; it has no body. On the outer side of each lateral mass is the transverse process, long and projecting laterally with its foramen which gives passage to the vertebral artery. Of the two arches the posterior assumes greater importance both from the standpoint of the injection technique and from that of the operative procedure. Its root is grooved by the vertebral artery which crosses it on its way to the foramen magnum.

The axis has doubled its body by borrow-

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ing that of the atlas to form the odontoid process. This process articulates in front with the anterior arch of the atlas and behind with the transverse ligament. Its laminae are thick, its spinous process is heavy and projects behind the third vertebra. Its transverse process is short and small and its vertebral foramen is replaced by a short canal curved upward, outward and slightly backward. The transverse processes of the other five cervical vertebrae are short and thin with an anterior and a posterior tubercle. They are shaped like a gutter in which lies the anterior primary division of the nerves. They slant downward, outward and forward and are almost hidden by the lateral masses or articular processes when the cervical column is considered from the back. Each has a transverse foramen through which pass the vertebral artery and veins.

The vertebral artery assumes an almost vertical position in its ascent through the foramina at the base of the transverse processes of the sixth, fifth, fourth and third cervical vertebrae, lying in front of the anterior primary divisions of the cervical nerves. On reaching the axis the vertebral artery passes into the transverse canal of the axis just described and curves outward and slightly backward, then upward and enters the transverse foramen of the atlas. As it emerges from this opening, it curves backward and inward around the posterior aspect of the lateral mass and lies in the vertebral groove on the posterior arch of the atlas. It then pierces the posterior occipito-atlantal ligament and enters the spinal canal.

The posterior occipito-atlantal ligament extends between the foramen magnum and the arch of the atlas with an opening for the entrance of the vertebral artery. The posterior atlanto-axial ligament extends between the arch of the atlas and that of the axis; these ligaments differ from the ligamenta subflava in that they are not elastic.

The posterior arch of the atlas, the laminae and spinous processes of the axis and of the five last cervical vertebrae constitute the deepest plane of the posterior region of the neck. These bony arches are separated from one another by spaces which are closed by the ligamenta subflava. Between the occipital bone and the atlas, between the atlas and the axis, these spaces are particularly large, the more so in extreme flexion of the head. The laminae of the cervical vertebrae are in overlapping position only below the axis so that the first two interlaminal spaces are in direct relation to the soft structures overlying them. The cerebellum and the medulla oblongata which correspond to the occipito-atlantal space, as well as the cervical spinal cord which begins at the atlanto-axial ligament are thus exposed to injuries by the point of the needle.

Trauma to the vertebral artery is almost impossible in the region below the axis; but between axis and atlas, it can be reached on the outer side of the lateral masses in the open space between the transverse process of the axis and that of the atlas, where it lies in a vertical position. The vertebral artery can still be more readily reached between the atlas and the base of the skull, because of its close proximity to the posterior aspect of the lateral mass and the posterior arch of the atlas against which it rests horizontally. It is there directly exposed to the point of the needle approaching the deep landmarks.

In the *dorsal region* the spinous processes, normally situated in the middle line of the back, serve as superficial landmarks in paravertebral block. The transverse processes are thick tubercles which articulate with the ribs at a distance of about from 3 cm. to 4 cm. from the middle line. The part of the rib just lateral to the transverse process is ordinarily used as a deep landmark for approaching each nerve as it leaves the intervertebral foramen.

In the *lumbar region*, the spinous process bears a constant relationship to the transverse processes of the same vertebra,

its upper margin being in line with these processes. Distortions are here less disturbing than in the dorsal region. In the lumbosacral region, the lack of fusion of the first sacral with the second sacral vertebra is not infrequently encountered. Incomplete sacralization does not interfere with the injection technique generally adopted for blocking lumbar and sacral nerves. Sometimes a loose first sacral is interpreted as a sixth lumbar vertebra; it is then considered in the same light as the other lumbar vertebrae. It could, however, be treated as a first fused sacral vertebra if its relationship to the ilium were closer than with the lumbar column.

In a general way, the posterior primary divisions of the cervical, dorsal and lumbar nerves emerge between the transverse processes and course backwards towards the operative field. From the standpoint of surgical procedure, they are the only ones that need be blocked, since they are the exclusive paths of sensory impulses starting from the operative field. Experience proves, however, that blocking of the anterior primary divisions is necessary as well in order to give better comfort to the patient during the jarring manoeuvers upon the spine.

The *sacral nerves* are injected by the transsacral method. They can always be reached through the posterior sacral foramina, both divisions being injected at the same time. It is unnecessary to give a caudal block, unless the coccyx be involved in the operation.

All these elementary anatomical considerations are of importance to the regional anesthetist for the reason that he must take his superficial landmarks with great accuracy in order to be able to reach the deep landmarks with comparative ease and safety. In approaching the deep landmarks he must know what are the dangerous zones in each segment of the spine and how to avoid them, particularly when distortions are present.

It has been my privilege to anesthetize a certain number of patients operated upon at the New York Orthopedic Hospital during the last five years for lesions involving each region of the vertebral column. I have selected a few of these cases to illustrate the subject of this paper which can best be discussed by giving details of technique employed in each case. I shall also describe such steps of the operation as will help realize the extent of the manipulations which were accomplished painlessly.

RESECTION OF THE POSTERIOR ARCH OF THE ATLAS

A boy, sixteen years of age, on July 29, 1922, in diving struck his head and became paralysed in his limbs. He was treated at Coney Island Hospital where a plaster cast was applied on the neck for eighteen days. On October 21, 1922, he was seen at the New York Orthopedic Hospital and the diagnosis of dislocation of the first cervical vertebra was made and confirmed by roentgen-ray examinations. The atlas and the odontoid process appeared to be dislocated anteriorly on the axis. On November 27 because of labored breathing and the frequency and severity of respiratory disturbances, among other severe symptoms of compression of the spinal cord, resection of the posterior arch of the atlas was advised and probably also fusion of the first two cervical vertebrae. Regional anesthesia was recommended because of the danger of struggling while going under or coming out of general anesthesia.

The posterior aspect of the neck showed a marked prominence in the upper cervical region, due probably to distortion caused by the forward displacement of the first cervical vertebra. The neck was rigid; rotation and lateral bending were especially limited. There was marked fullness of the muscular structures around the affected area and the muscles were stiff.

It was first decided that the atlas would be approached by a midline incision about 4 inches long and extending from the external occipital protuberance downward. The posterior primary divisions of the cervical nerves supply the posterior aspect of the neck as well as the occipital portion of the head. These nerves are best reached by depositing the solution in close contact with the lateral masses of the vertebrae

and the base of the skull, no attempt being made to reach them individually.

The spinous process of the sixth cervical vertebra was quite palpable; it was used as a basic superficial landmark for the selection of the sites of puncture above that level. Two intradermal wheals were raised, one on each side of the process at approximately 3 cm. from the midline of the nape. Two other wheals were raised, one on each side, midway between the external occipital protuberance and the base of the mastoid process. Along the vertical lines joining the upper wheals and the lower ones and proceeding from below upward other wheals were raised about 2 cm. apart.

A needle (the 50/7 of my set), unattached to the syringe, was introduced through each of these wheals in succession and advanced along a posteroanterior plane until bony contact was felt, which I expected was the row of lateral masses. Considering the nature of the skeletal lesion and with due regard to the anatomy of the region, extraordinary precautions were taken in approaching first and second cervical vertebrae. The syringe was connected to the needle after each bony contact had been made and injection was made of 5 c.c. of a 0.5 per cent solution of neocaine to which 10 drops of adrenalin solution 1:1000 had been added to the 100 c.c. prepared beforehand. Injections were then made fanwise in the anteroposterior plane passing through the sites of injection and the sites of puncture, involving the entire thickness of the soft structures traversed by the needle. These fanwise injections not only completed the anesthesia started by the deep injections but served to reduce bleeding to its lowest term.

The operation was performed by Dr. Hibbs. A 4 inch incision was made extending caudad in the middle line from the occipital protuberance, and by careful dissection the spinous process of the second cervical vertebra was exposed. Subperiosteal dissection of this was carried out to the lateral processes, with very little hemorrhage and then the tissues between it and the first cervical vertebra were split and separated in the midline.

When these were retracted laterally on both sides, the dura was exposed for a distance of nearly one inch and it was seen that the spinal cord was here at an angle of about 120 degrees. The neural arch of the first cervical vertebra was still out of sight, due to the anterior displacement of the first cervical vertebra and the occiput on the second cervical. Careful dissection exposed the laminae of the first cervical vertebra and this was found to be dislocated anteriorly at least three quarters of an inch. Due to this dislocation the spinal cord was angulated between atlas and axis and was pressed against the neural arch of the atlas. All these operative procedures were painless except when sponging, making pressure against the dura. This caused sharp pains in the trunk and legs and caused the legs to jerk.

A blunt periosteal elevator was then placed between the dura and the neural arch of the atlas, and with the chisel, curette and rongeurs about ¾ inch of the entire thickness of the neural arch was removed. Pressure was relieved, the posterior ligament bulged through the space left by the laminectomy and the cord straightened out almost entirely.

Because of the amount of laminae removed from the atlas and because the dislocated vertebra was apparently firmly held in its new position, fusion was not attempted.

There was very little hemorrhage. The anesthesia was perfect, except when pressure was applied to the dura and cord. The patient otherwise felt quite comfortable and read a newspaper during the entire operation.

SPINAL FUSION FROM SEVENTH DORSAL TO SECOND LUMBAR

T. W., female, aged thirty years, had a sharp kyphosis in the dorsolumbar region, extending from the ninth dorsal to the second lumbar vertebra with apex at the twelfth dorsal. Spasm, rigidity and pain added to the difficulty experienced in defining landmarks.

Roentgen-ray examination had revealed the left diaphragmatic pleura elevated by a large mass about 6 by 6 inches centered at the eighth rib posteriorly, apparently an abscess.

Anesthesia Procedure. Two elements here conspired against the success of the operation: (1) the precarious condition of the patient; and (2) the extent of the operative field, for which an enormous dose of fluid would be needed to produce adequate anesthesia. In consideration of these disadvantages, it was decided to use a weak solution of neocaine and to increase the dose of adrenalin usually employed. Injection was made of 225 c.c. of the 0.5 per cent solution containing 30 drops of adrenalin solution, 1:1000. The dorsal and lumbar nerves were blocked individually from the sixth dorsal to

the third lumbar by modified paravertebral technique. The needle was introduced 3 cm. laterally to each spinous process and advanced in a posteroanterior direction towards the transverse process with which it came in contact rather easily. The needle was then passed above and tangentially to the transverse process to a point, in the dorsal region 1 cm. and in the lumbar region 2 cm. deeper than the posterior surface of that process. Attempt was made to pass the needle over the base of the transverse process rather than over its tip. Injection of 5 c.c. of the 0.5 per cent solution of neocaine was made in each intertransverse space. Through the same sites of puncture, fanwise injections completed the anesthetic procedure. These were carried in an anteroposterior plane and involved the entire thickness of the overlying soft structures comprised between transverse processes and skin. A subcutaneous infiltration along the two vertical rows of puncture and another joining the upper wheals transversely, was the last step of the technique. In making the paravertebral injections, pus was aspirated twice, once at the level of the first lumbar on the right side and the second time at the level of the eighth dorsal on the left side.

The injections were made slowly and the patient closely watched. Considering the poor shape in which she appeared on the operating table and the amount of solution needed to ensure complete anesthesia of such a wide operative field, reaction was slight and in no way influenced postoperative prognosis. The patient had had no preoperative narcotic medication. There was a short period of nervousness accompanied by rapid pulse and light cyanosis of the lips, ears and nails. These circulatory disturbances, aided by adrenalin and exaggerated by her tuberculous condition, cleared up while the operation was being completed. The patient returned to her room feeling as well as when she left it.

Operative Procedure. A midline incision was made exposing the tips of the spinous processes of the second dorsal to the second lumbar inclusively. The laminae were exposed to the bases of the transverse processes. The ligamenta subflava were curetted from between the laminae and the articular cartilages removed. Bony bridges were turned down from adjacent laminal margins and interlocked across the interlaminal spaces. The spinous processes were broken down and the wound closed.

SPINAL FUSION FROM TWELFTH DORSAL TO FOURTH LUMBAR

F. R., male, aged forty years, was thin, emaciated and had the typical appearance of active pulmonary tuberculosis. There was limited extension of the right thigh and a large soft mass was present in the right iliac fossa. Posteriorly, the lower dorsal and lower lumbar regions were prominent. There was no definite kyphosis, but the spine was rigid throughout with accompanying defensive contracture of adjoining muscles.

Anesthesia Procedure. Bilateral paravertebral block of dorsal ten to lumbar five was accomplished with 100 c.c. of 1 per cent neocaine solution containing 12 drops of adrenalin solution 1:1000. This was followed by a field block consisting of fanwise injections through the rows of paravertebral punctures, using 100 c.c. of the 0.5 per cent solution of neocaine containing 10 drops of adrenalin solution 1:1000. Technique was similar to that detailed in the preceding case.

The patient's condition was very good, although pulse rate increased from 110 to 135 during induction of anesthesia returning to normal a few minutes later. There was no cyanosis of the lips and ears, but his nails were slightly bluish, this being explained by the deficiency of his pulmonary circulation as a result of tuberculosis. On being questioned the patient said that he felt quite comfortable. Anesthesia was perfect.

SPINAL FUSION FROM SECOND LUMBAR TO FIRST SACRAL

E. T., female, aged thirty-four years, had a very moderate lumbar and left thoracic scoliosis. The lower lumbar and sacral areas were tender. Roentgen-ray examination revealed the presence of a thin disc between fourth and fifth lumbar vertebrae. The fifth lumbar vertebra was subnormal in height and spinous processes of the fourth lumbar to the first sacral were in abnormally close relation. The body of the first sacral was not firmly fused to the second vertebra.

Anesthesia Procedure. Paravertebral block was performed from lumbar one to lumbar five and transsacral injections made of the first sacral and second sacral according to usual technique; using 100 c.c. of the 1 per cent neocaine solution containing 10 drops of adrenalin solution 1:1000. Field block through

the paravertebral wheals completed anesthetic procedure. This was made with 100 c.c. of 0.5 per cent solution of neocaine. The anesthesia was very satisfactory; the patient complaining of practically no pain except when undue force was used in retracting. He had a few vomiting spells during operation, but left the table in good condition. There were no postanesthetic disturbances.

SPINAL FUSION FROM DORSAL SIX TO DORSAL TWELVE

In this case of Pott's disease, there was a small kyphosis at the ninth dorsal spine. Muscle spasm was quite marked in this area. There existed also in the lower extremities a degree of flexion in the one leg and a painful condition in the other, which rendered the supine position impossible. The patient was placed on his right side, the frontal plane of the body making with the table an angle of about forty-five degrees. He was injected and operated upon in this position.

Anesthesia Procedure. Paravertebral block was performed from the fifth dorsal to the first lumbar with 0.5 per cent neocaine solution containing 10 drops of adrenalin solution 1:1000 per 100 c.c. Bilateral field block was then made with a solution of the same concentration, using in all 150 c.c. This included a subcutaneous injection along the rows of intradermal wheals raised on each side of the spinal column to approach the nerves individually and one joining the first upper wheals transversely. Because of the position of the patient injection on the right side was more difficult than on the left. The number of nerves to be blocked and the extent of the operative field, namely, from the fifth dorsal to the first lumbar suggested the use of a 0.5 per cent solution of the anesthetic and the poor condition of the patient made the injection of a comparatively small amount imperative. Only 5 c.c. was deposited at each of the 18 nerves supplying the operative field, leaving 60 c.c. for distribution in the tissues according to the field-block procedure already described.

The anesthesia was satisfactory, but not as complete as desirable. Jarring of the spine was painful and throughout the operation the patient felt much discomfort on account of his position. The anesthesia was light and lasted only about three-quarters of an hour; subsequent injection of the soft structures being necessary to permit closure of the wound without pain. There was no reaction to the anesthetic and the patient left the table in fair condition.

COMMENT

The few cases reported in this paper serve not only to illustrate use of regional anesthesia for orthopedic operations upon the spinal column, but allow certain inferences concerning practical value of the method.

The prone position is best, because it facilitates the paravertebral injection technique and keeps muscles of the back as relaxed as skeletal disturbances permit. Lateral distortions are thus avoided and the patient feels more comfortable, particularly when some of the vertebrae suffer from abnormal mobility. An example of the discomfort caused by lateral position is shown in the last case.

The anesthetic solution employed needs careful consideration as regards both its concentration and the quantity injected. In advanced tuberculous conditions, it is advisable to use a 0.5 per cent solution even in paravertebral block. As high as 225 c.c. was injected in one of the patients with a reaction that gave us no concern and did not justify the administration of any treatment, not even a cardiac stimulant. When the quantity of the 0.5 per cent solution was reduced to 150 c.c. in the last case, for the injection of an equally extensive field, the anesthesia was weak both in quality and duration; but there were no circulatory disturbances of any kind. Analysis of these two cases shows that we should not sacrifice perfect anesthesia to the possibility of a brief period of circulatory reaction which if it should occur, has no clinical significance. Of course there is a limit to the use of the 0.5 per cent solution, and this we would, in these particular cases, fix at 250 c.c. when injection is made very slowly.

The use of large amounts of adrenalin does not seem to help when the blood pressure is low. Those suffering from pulmonary tuberculosis have a defective

circulation which far from being benefited by the adrenalin mixed with the neocaine solution, turns slightly bluish from peripheral asphyxia. The blood oozing from the operative wound may at times be dark. It is now recommended to add but 5 drops of adrenalin solution 1:1000 to each 100 c.c. of the anesthetic solution injected. This is quite sufficient to delay absorption, strengthen the anesthesia and increase its duration.

The modified technique of paravertebral block by which the nerves are approached from a point overlying the transverse process is recommended because the same wheals are used for the field block which is associated with the paravertebral block. In making the barrage as close to the middle as the operative technique permits, forcible retraction causes no discomfort and part of the injected fluid finds its way through the wound. The best advantage derived from the narrow field block is certainly the ischemia of the operative field which facilitates dissection.

No attempt was made to use the regional method for operations on children.

CONCLUSIONS

Orthopedic operations upon the spinal column are all amenable to the regional method, provided that the injection technique be considered in the light of individual anatomical distortions. A thorough knowledge of anatomy is the prerequisite of the anesthetist.

Decompression of the cord at the level of the first and second cervical vertebrae is rendered less difficult and certainly less hazardous when regional anesthesia is the method employed. The use of regional anesthesia for similar operations at lower levels of the spine can be made with great advantage both to surgeon and patient.

Extensive spinal fusions are made possible with little or no postanesthetic disturbance, and the prognosis of these operations is greatly improved, particularly when active tuberculosis of the lungs is present.

FRACTURE OF THE FIFTH METATARSAL BONE WITH SPECIAL REFERENCE TO DELAYED UNION

LOUIS CARP, M.D.

(Author's abstract)

Twenty-one cases of fracture of the fifth metatarsal bone will be considered to illustrate a tendency toward delayed union probably caused by poor blood supply. Knowledge of this tendency is necessary for prognosis and treatment.

In 1855 Breithaupt first described the condition known as "fussgeschwulst." He noted that soldiers on the march were frequently disabled by painful, swollen and tender feet, and he attributed this condition to strained ligaments and tendons. Subsequently the condition was described under various other names, but in 1898 Kirchner by roentgenogram first showed it to be a fracture. There have been occasional references in the literature to the slow formation of callus in some fractured metatarsals. Delayed union in some fractures of the fifth metatarsal could easily explain the picture presented in "fussgeschwulst."

The fifth metatarsal bone consists of base, tuberosity, shaft and head. It must be remembered that the tuberosity has a separate epiphysis which makes its appearance at about the twelfth year and is completely ossified at about the sixteenth. The muscle and ligamentous attachments to the base and the shaft play an important rôle in the production of fracture by indirect violence. The nutrient vessel of the fifth metatarsal is very small and is represented by only a few fine branches which anastomose with the small blood vessels of the epiphyses.

The usual mechanism of fracture of this bone is by indirect violence, while its exposed position is a predisposing factor for its injury by direct violence.

An analysis of 21 cases from the Presby-

terian Hospital given in the table shows the following:

1. Sex	Males					9 (47 per cent)
	Females					12 (53 per cent)
2. Age	Youngest					13 years
	Oldest					60 years
	Average					36 years
		Base	Tuberosity	Shaft	Distal Extremity	Total
3. Violence	Direct	3 (38 per cent)	1 (12 per cent)	2 (25 per cent)	2 (25 per cent)	8
	Indirect	7 (64 per cent)	2 (18 per cent)	1 (9 per cent)	1 (9 per cent)	11
	Doubtful	2 (100 per cent)	.....	.....	.....	2
4. Predominant symptoms and signs—pain, swelling, ecchymosis and tenderness.						
5. Length of disability (16 cases)	Shortest					2 weeks
	Longest					24 weeks
	Average					10 weeks
6. Females tend to have a longer disability than males.						
7. The end-results are good.						

A further analysis of the 20 cases in adults shows that there were five cases which from clinical and roentgen-ray evidence had delayed union. This occurred four times at the base and once at the distal extremity of the shaft. All the other cases that could be followed had characteristic pain, tenderness and edema at and surrounding the area of fracture, which extended over periods of weeks or months. While it is true that soft part injury in association with the fracture might produce these symptoms for a short period, still interference with proper bony union is the most plausible explanation for the long disability.

One would expect in a long bone as small as the fifth metatarsal, that enough union would take place in the cancellous portions in about ten days to prevent mobility of the fragments. In the cortical bone of the shaft, normal calcification should occur in about three weeks. The callus may be scarcely visible in the roentgenogram, it may be excessive, or it may be long and thin. It must be remembered, however, that time for the roentgenographic appearance of callus is variable.

The treatment recommended for fracture of the fifth metatarsal is immobilization of the foot and leg by means of a posterior molded plaster splint, which will permit physical therapy. If there is a tendency to delayed union, the administration of calcium or cod liver oil is recommended. Scarification of the fractured end with a needle introduced through the soft parts in order to produce bleeding may be tried. Excessive trauma to demonstrate mobility of the fragments is to be avoided.

Summary. Twenty-one cases of fracture of the fifth metatarsal are reported, with their analysis. Twenty were in adults and of these five showed clinical and roentgen-ray evidence of delayed union. All the latter had a normal blood calcium and phosphorus and a negative urine and blood Wassermann reaction. All the other cases that could be followed had clinical symptoms over such long periods that it is fair to assume some interference in bone repair. The main cause of this condition is probably the poor blood supply of this bone. The treatment is directed toward immediate immobilization and hyperemia. The experience from all these cases tends to show that too long immobilization produces bone atrophy which certainly cannot help bone repair. Weight-bearing in a strong molded plaster splint before one month, where possible, is suggested to overcome this bone atrophy. Between the ages of eleven and sixteen years the epiphysis of the tuberosity is not to be mistaken for fracture.

Discussion

Dr. Arthur H. Cilley: The only cases of this kind that I have seen I treated like an

ordinary metatarsalgia. I have insisted on walking from the first day; and I have not seen any case of delayed union.

Dr. Sigmund Epstein: I think Dr. Carp should have given more attention to the cases that have vicious union especially fractured tuberosities. These are the ones we are most interested in. Many of them are very painful.

Dr. Harold D. Corbusier: There should be no interference with rapid repair such as too much limitation of motion and I do not see the necessity of putting such fractures in plaster casts. There should not be too early weight-bearing but passive motion of ankle and toes is essential. Of course, the fragments should be gotten back into position as soon as possible and as accurately as possible, even if an open reduction must be done. Recently I had to amputate part of the base of the fifth metatarsal for non-union, treated by too long a period of immobilization. The circulation should be stimulated as much as possible, preferably by hot baths and the use of diathermy.

Dr. Walter M. Brickner: Dr. Carp has done a service in calling attention to the fact that delayed union is common in these cases and in giving a logical explanation for it. I reported two of these cases several years ago, not many years after the condition was first described by Robert Jones. I believe that prolonged immobilization produces bad results, not only in these metatarsal cases but in all fractures. Dr. Carp spoke of putting a needle between the edges of the fracture to stimulate union by producing bleeding. In cases of delayed union in fractures generally I have for many years practiced Bier's procedure—injecting the patient's own blood (taken from a vein) between the edges of the fragments or around them, and this has often given excellent results. I have had several cases of fracture of long bones that resisted all efforts to secure union and that have responded so promptly after the injection of blood that I have considered this responsible. I have spoken in praise of this method before and have usually heard it laughed at as lacking rationale because there is abundant blood exuded when the fracture is fresh. Nevertheless, when there has been delayed union and the bone ends are more or less smooth, blood does seem to stimulate osteogenesis. I believe the injection of blood in cases of delayed union is often exceedingly useful and that it ought to be tried in all cases before proceeding to more radical measures.

Dr. Leon T. LeWald: Dr. Carp said that the epiphysis of the tuberosity of the fifth metarsal bone does not show complete ossification until about the sixteenth year. I have always considered this the exception and not the rule.

Dr. Carp (closing): It was very interesting to hear Dr. Cilley's method of treatment, to make the patient walk immediately. Some cases do well by this method. If he has never had a case of delayed union, I would like to know how long he followed his cases and how much pain they had weeks or months after the fracture. As to Dr. Epstein's remarks on vicious union, such cases do occur and have been very well described by the French. When there is a large callus it may impinge on the adjacent metatarsal and operation may be necessary. In reply to Dr. Corbusier, I can only say that I believe these patients ought to have immobilization of the foot and leg on account of the action of the peroneus brevis and tertius in flexion and extension at the ankle. I was very much interested to hear about the case in which he had to operate because of delayed union. As far as injecting the patient's own blood around the fragments of the fracture is concerned, that has often been done, but in most instances we have found it efficacious merely to put the needle between the fragments and start a little bleeding. Answering Dr. LeWald, an epiphysis for the tuberosity is, I think, the rule, and complete ossification, according to Schouwey who has done a great deal of work on this subject, is complete at about fifteen and three-fourth years.

PRESENTATION *of* INSTRUMENTS

A DEVICE FOR STRETCHING THE MUSCLES OF THE FOOT AND LEG AND OVERCOMING KNEE CONTRACTURES

HENRY KELLER, M.D.

(By invitation)

This device is a simple stretching bench which is capable, with very slight effort, of stretching the shortened calf muscles, the inverters and everters, as well as the foot muscles proper, and besides is capable of correcting mild flexion deformities at the knee joint.

I have used the device for the last year and I have had a chance to watch the effect of the treatment of the stretching upon some of my patients. There have been five adults, for whom, under the old methods, I would have advocated tenotomizing the muscles. Under this method of treatment I was able to spare them the inconvenience of an operation and a consequent plaster immobilization. All the patients were able to pursue their usual occupations while under treatment, and the results of this conservative method was to my mind just as effective as and perhaps more so than if operative procedures had been instituted.

The apparatus consists of a bench upon which the patient can sit and an attachment of a serrated bar (1) which can be either lengthened or shortened by the handle (2) which is attached to the side of the chair as shown in the illustrations. On the other end of the bar a foot-piece is attached (3) which rests upon a post (4) and can be revolved in or out by the turning of the wheel (5) or anteroposteriorly by the manipulation of the handle (6) which moves the wheel at the foot part of the apparatus. The foot being anchored to the foot-piece moves by the same manipulation. There are two small attachments not seen on the photographs (7); one is near the bench and the other at the outer end of the apparatus, so constructed and so attached as to be able to lock the bar as well as the foot part at the desired position in either extension or flexion. The key (8) attached to the post of the metal part is to hold permanently the limb in eversion or inversion in which the patient's foot has been placed. The leather cuff attachments, (9) and (10), are for the purpose of holding the knee straight, so that the stretching of the calf muscles may be more effective. Incidentally, they can also be used when flexion deformity of the knee is present. In attempting to correct the latter it is necessary to anchor the knee to the metal bar (1) in order to get the results desired. By anchoring of the heel part of the foot to the heel cup of the apparatus, and pulling upon the fore-part of the foot with stout webbing or straps, the small muscles of the foot can be stretched effectively, the loose ends of the straps being tied to the special prong-like metal piece attached to the bar of the apparatus.

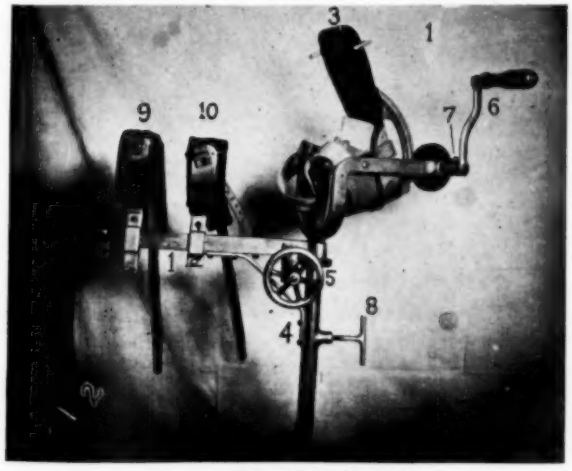


Fig. 1. Stretching bench.

Fig. 2. Stretching bench in action.

The bench idea for stretching I received from J. J. Nutt, and I hereby acknowledge my obligation to him. I wish also to thank Robert Linder, Inc. of New York City for their kind cooperation in perfecting the apparatus.

PRESENTATION OF CASES

TRAUMATIC SEPARATION OF SYMPHYSIS PUBIS WITH SEPARATION OF SACROILIAC JOINTS

HARRY D. SONNENSCHEIN, M.D.

This case is presented as one of dislocation of the iliac bones on the sacrum, with a separation of the symphysis pubis, as a result of severe trauma, rather than as a true dislocation of the sacroiliac synchrondrosis.

The case is characteristic of very severe trauma to the pelvis; there results either frac-

ture of the pelvic bones with no demonstrable lesion at the sacroiliac articulation, or dislocation of the sacroiliac joints with no fractures of the pelvis present. This is the fourth case of this type we have seen at the Harlem Hospital.

Fig. 1.

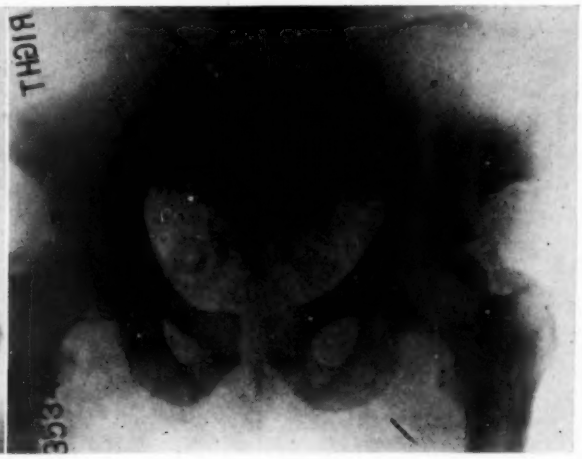


Fig. 2.

This patient, aged thirty-four years, was caught between an automobile and a wall, on February 11, 1927, and was at once admitted to Harlem Hospital in deep shock. Intra-abdominal injury was suspected. He had a compound fracture of the right ulna and compound dislocation of the head of the right radius. A diagnosis of fracture of the pelvis was also made, until a roentgenogram disclosed the true condition. (Fig. 1.)

By means of a swathe, lateral traction was applied to the pelvis, and at the end of six days decided improvement was noted roentgenographically. The patient's general condition was then such as to allow general anesthesia, and an attempt at further reduction was made. The result is seen in Figure 2, the patient's present pelvic condition.

As a matter of note, we were never able to palpate this separation of the symphysis.

(*No discussion*)

EPIPHYSEAL SLIPPING AT THE HIP JOINT, WITH OPERATIVE RESULT

ELMER P. WEIGEL, M.D.

W. H., male, aged fourteen years, was seen by me September 17, 1926. Since March, 1926, he had complained of pain, limp and limited motion of left hip and gradual shortening of left lower extremity. He remembers slipping while crossing a railroad track; the left leg went out to his side, but he did not fall or complain at the time. Two days later the hip was sore but he thought nothing of it, and continued to go to school. After two weeks the pain was bad enough to consult a physician who treated him for rheumatism. Two weeks after that a roentgenogram was taken which was reported negative. An osteopath seen at this time advised massage. During the summer the leg was becoming thinner and shorter and there was less motion at the hip. The patient was then

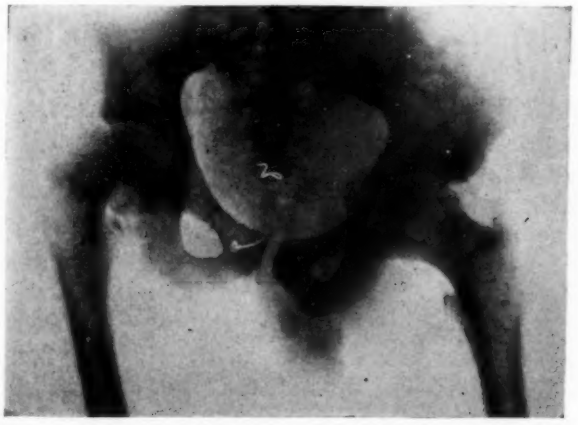


Fig. 1.—Epiphyseal slipping of hip. Before operation.

roentgenographed again and a diagnosis of Perthes' disease was made. He was put to bed and traction was applied.

Physical examination, September 17, 1926: Left leg in marked adduction. All motions at hip limited, particularly abduction. These attempts were painful. There was 1½ inches actual shortening of the extremity, and 1¼ inch

atrophy of the thigh muscles. Temperature, pulse and respirations normal. Wassermann reaction negative. Roentgenogram showed marked epiphyseal slipping of left hip with leg in adduction.

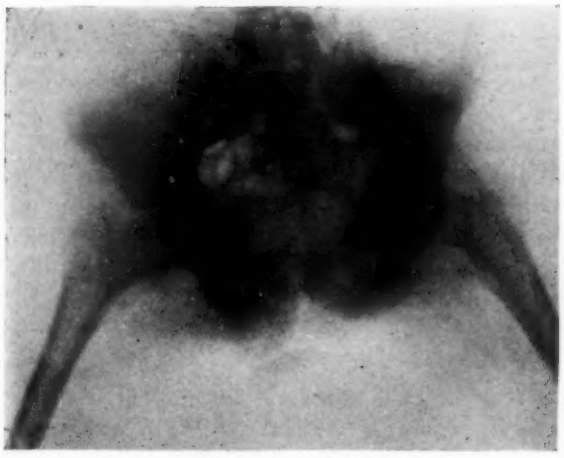


Fig. 2.—Epiphyseal slipping of hip. After operation.

Operation, September 28, 1926: Smith-Peterson incision. Epiphysis was found to have slipped down on the neck so that it was barely touching at its upper margin. There was considerable attempt at callus formation. With a broad osteotome the head was cut free from the neck and the leg was sharply abducted and by means of a periosteal elevator the epiphysis was skidded into its normal relation to the neck where it remained without suture. A double plaster spica was applied in marked abduction for eight weeks.

November 13, 1926. Cast removed. Wound healed. Roentgenogram showed relation of fragment good and callus present. No shortening at this time. Patient began walking and now has no limp or pain.

(No discussion)

SPONDYLOLISTHESIS TREATED BY BONE GRAFT

ELMER P. WEIGEL, M.D.

M. B., female, aged twenty-eight years, seen by me December 28, 1925, complained of rheumatic pains in her back for one and one-half years. The onset was gradual and not due to trauma. She had always been well and had been doing office work. Family history negative for chronic diseases. She had consulted doctors, had had antirheumatic treatment and also had had a plaster cast applied for three months with no relief.

Physical Examination: Small girl, well nourished, normal except for a marked lordosis in lumbar region with some tilting to the right.

Fig. 1.—Spondylolisthesis. Anterior view. Before bone graft.

Fig. 2.—Spondylolisthesis. Anterior view. After bone graft.

Motion of lower spine limited and attempts cause pain. Marked muscle spasm was present. Roentgenogram shows slipping of fifth lumbar body forward on sacrum and some lateral displacement to the left. Wassermann reaction negative.

Operation, January 6, 1926: Bone graft from tibia to third, fourth and fifth lumbar spine and into sacrum (Albee technique). Patient kept flat in bed for eight weeks; then got about gradually using crutches for three months. Fitted with a long heavy-boned corset. Rest and quiet for six months.

Returned to work November, 1926. Now can walk twenty blocks without pain and is doing her previous work.

(*No discussion*)

OSTEOSARCOMA OF THE FEMUR FOLLOWING FRACTURE

LANTERN SLIDE DEMONSTRATION

HENRY KELLER, M.D.

(By invitation)

A man, aged forty-eight years, single, came to the Cancer Hospital, September, 1926.

Eighteen months previously he had jumped on the tail-board of a truck and struck his right leg, but he paid no attention to this injury and continued to work. A few days later he began to feel slight pains in his right knee,

Fig. 1.

he noticed a small lump there and began to walk lamely. The condition remained the same for six months. About that time the patient left his job as moving van helper for lighter work in the kitchen. In January, 1926, he went to Bellevue Hospital, on account of his leg condition, where he was given baking and

Fig. 2.

massage for awhile, without relief. Two Wassermann tests were negative.

Fig. 3.

In August, 1926, while intoxicated the man fell down on the street, injuring the same limb. He was taken by ambulance to Bellevue Hospital, and a few days later it was noticed that there was fracture of the right femur. A

cast was applied and on September 13, 1926, the patient was transferred to the City Cancer Hospital, with diagnosis of a probable giant-cell sarcoma of the right femur. On September 17, the cast was removed at the Cancer Hospital, and after examination, a diagnosis of a badly united fracture was made, and the patient was transferred to the Neurological Hospital (Figs. 1, 2).

The examination there showed swelling of the knee with considerable effusion, and a shortening of that limb about 1¾ inches, as compared with the left side, the patient walking with decided limp. The diagnosis made by the surgeon in charge during my absence, was fracture of the right femur, badly united, and synovitis of the knee. A month later, when I was called I found the condition as outlined above: a good deal of thickening around the lower femoral region, partial ankylosis of the right knee, and a good deal of effusion. The patient also had slight pains in his back. Roentgenograms of both limbs and spine showed many osteophytic outgrowths of the spine, in the lumbar region, also a good deal of thickening around the right femur, with an overriding and badly united fracture of that region.

Diagnosis made then was osteoarthritis of the knee joint and spine and ununited fracture of the femur. The roentgenologist concurred in the opinion. We therefore withdrew some of the fluid from the knee joint and immobilized the limb in plaster of Paris.

Roentgenogram taken October 14 was more suspicious of a growth, but it was not conclusive, and in view of the fact that there were no other signs of malignancy in the patient's condition, we went on treating him with rest, diathermy and massage.

The last roentgenogram (Fig. 3), January 25, 1927 shows marked destruction of the femur and entire knee joint, establishing beyond doubt presence of a growth, involving the entire fractured area as well as the joint, and resembling in every way a sarcoma.

Dr. Isaac Levine, Director of the Cancer Institute, called in consultation again, confirmed the findings. The patient was transferred back to the Cancer Hospital, where a high thigh amputation was performed on February 15. The pathologist, Dr. Joseph reported the specimen as a spindle-celled osteogenic sarcoma. The patient showed some improvement but now has suspicious signs of metastasis in the lungs and probably the liver. The interesting features of the case are the obscure invasion of the growth with very little pain, its slow, gradual progress, and the question whether the condition followed the previous injury, or whether the fracture of the femur was the result of a weakening of the bone due to the presence of pathological changes.

(No discussion)

EDITORIALS

MUSCLE-FASCIA SUTURE IN HERNIA OPERATIONS

IN an editorial discussion of The Rationale of Surgical Measures for the Cure of Oblique Inguinal Hernia (the JOURNAL, March, 1926) we said that Bassini's herniorrhaphy is not, as many think, a reparative operation upon a disordered inguinal canal, not an attempt to restore the canal to an anatomic normal, but an effort to alter the architecture of the canal; for the chief plastic feature of Bassini's operation and of most of its modifications is the attachment by sutures of the so-called conjoined tendon (of obliquus internus and transversus) to Poupart's inguinal ligament, thus essaying to provide a muscle support for the peritoneum and abdominal contents across an area where *normally no such support exists!* Further, we said that what is sutured as "conjoined tendon" is not tendon at all (except at its very termination), but the rounded edge of the obliquus internus muscle; and that much misgiving has arisen concerning dependability upon union between muscle and aponeurosis thus artificially contacted. We quoted the conclusion of Seelig and Chouke from their dog experiments,[1] that "normal muscle will not unite firmly with fascia or ligament. It is, therefore, a useless procedure to suture the abdominal muscle to Poupart's ligament," a conclusion that had been widely accepted, although not in agreement with the observations of some surgeons made at secondary operations.

Our editorial was prompted partly by the appearance of the assertion of A. R. Koontz, of Baltimore,[2] that if Seelig and Chouke had removed the layer of areolar tissue that separates the fascia lata from the underlying muscle before suturing these structures they would have secured, as he did, firm fibrous union between them. Koontz also secured good union, in his dogs, by suturing the obliquus internus to Poupart's ligament, even though the muscle had to be drawn down under considerable tension; and he demonstrated fibrous tissue growing from the ligament into the muscle, and capillaries passing freely from the muscle coverings into the ligament. Gallie and LeMesurier had also demonstrated in their experiments upon tendinous and aponeurotic structures that it is important to have no intervening areolar tissue; and, in fact, experienced herniotomists rub this thin layer off the ligament with a gauze wipe or scalpel.

Seelig is not convinced by Koontz' experiments and maintains the opinion based on his own.[3] It is therefore of interest to note in last month's *Annals of Surgery*[4] the report of dog experiments in muscle-fascia suturing by Rosenblatt and Cooksey of Detroit. They repeated the muscle-fascia lata operations of Seelig and Chouke and of Koontz and the inguinal muscle-ligament suturing of Koontz. Their observations in twenty-seven dog operations support those of Koontz entirely. They found that firm union resulted in all cases in which the areolar tissue was removed from the muscle and fascia before suturing, whether in the inguinal canal or in the thigh, and that the general type of union is the same as that between fascia and fascia.

That the rounded muscle can be thus united to the inguinal ligament is quite apart from the rationale of such a procedure which, as we pointed out in the editorial referred to, is not only not a restorative step but, in many cases of inguinal hernia,

[1] *Archiv. Surg.*, 1923, vii, 553.
[2] *Surg. Gynec. & Obst.*, 1926, xlii, 222.
[3] Personal communication.
[4] lxxxvi, 71.

is not a necessary one. As Rosenblatt and Cooksey state in their conclusions, it is not always indicated to suture muscle to fascia, but it may be relied upon if areolar tissue is first removed. Probably union will be more certain if the smooth edge of the muscle is also traumatized by numerous snips of the scissors. The point of interest in these experimental demonstrations is that the more disfiguring and more complicated operation of weaving strips of fascia lata back and forth between muscle and ligament (Gallie and LeMesurier) should be reserved for those cases in which satisfactory contact of substantial structures cannot be made. These are the cases of, especially, recurrent or of very large hernia in which transversus fascia is grossly deficient and in which the muscles are attenuated and widely separated from Poupart's ligament. In some of these a transplantation of a sheet of fascia lata might be better than a weaving of fascial strips.

In most cases of oblique inguinal hernia, we repeat, the high ligation of the sac and the restoration of the transversus fascia are steps more important than plastic closure of the canal. The latter is undeniably useful, however, as an artificial support for the peritoneum whenever its normal support, the transversus fascia, cannot be certainly restored by suture.

W. M. B.

A TRIBUTE TO DR. L. L. HILL

TO accompany the glorious appreciation of Lord Lister, published in this issue of the JOURNAL, I regard it as a privilege to present a sketch of its author. Every Southern surgeon will rejoice with me in reading the eulogy of a master by his devoted disciple and also in giving deserved recognition to one of our number who, owing to his modest and retiring disposition, is not as widely known as he should be.

Here is, indeed, another "Alabama Student." Dr. Hill was well prepared for the study of medicine and evidently from the beginning determined to fit himself for the practice of surgery. It was not altogether a common custom for young men of our section to finish their medical education abroad, but Hill, after taking degrees at two good colleges in this country, repaired to London, where he spent six months in Lister's clinic, and then to the continent on a visit of more than a month to the best hospitals. His career, then, had an inception out of the ordinary. In truth he is a man out of the ordinary. He has been an outstanding man. His surgical skill, notable for accuracy and boldness, as with all pioneers; his studious habits and his fine ability to express himself; his high character and unswerving loyalty—all these have marked Dr. Hill as a man of superior intelligence and ability.

Luther Leonidas Hill was born in Montgomery, Alabama, on January 22, 1862, the son of the Reverend Luther Leonidas Hill, Methodist minister, and Laura Sarah Croom Hill, both natives of Alabama. His original American ancestor, William W. Hill, emigrated from England to North Carolina in 1687. Dr. Hill lived on a farm about four miles out of the City of Montgomery from his infancy until the time he went away to college. His early education was acquired in the school of Professor George Thomas at Montgomery. He later went to Howard College, then at Marion, Alabama, but now at Birmingham, where he completed the junior academic year. He was graduated from the medical department of New York University in 1881 at the age of nineteen. He spent the summer of that year attending lectures at hospitals in New York City. He was also graduated in medicine in 1882 from the Jefferson Medical College, Philadelphia, where he went that he might attend the lectures of Samuel Gross. He attended the New York Polyclinic where he completed a course on the eye, ear, nose and throat. From October 1, 1883, to April 1, 1884, he

was at King's College Hospital, London, where he studied surgery under the instruction of Joseph Lister and John Wood. After visiting the principal cities of Europe, he returned to Montgomery, Alabama, and on May 15, 1884, began the practice of medicine there, specializing in surgery.

For five years Dr. Hill was surgeon of the Second Alabama Regiment of the National Guard and in 1910 he was made Surgeon General of the Alabama National Guard.

Luther Leonidas Hill, M.D.

In 1910 he was appointed a trustee of the Alabama School for the Deaf and Blind. In 1887, he was elected President of the Montgomery Medical and Surgical Society. In 1888 he was elected counselor of the Alabama State Medical Association and in 1897 he became President of the Alabama State Medical Association, being one of the youngest, if not the youngest, ever to hold this position. As President of the State Association he originated the Jerome Cochran Lecture in honor of the distinguished pioneer health officer of the State of Alabama. In 1913 he delivered this lecture, using as his subject "Surgical Complications and Sequels of Typhoid Fever."

Dr. Hill is now Grand Senior Life Counselor of the Alabama Medical Association. In 1897 he was President of the United States Board of Pension Examiners and in 1893 was President of the Montgomery Board of Health. For many years he has been surgeon for the Mobile & Ohio Railroad. Since 1897 Dr. Hill has been visiting surgeon of the Laura Hill Hospital of Montgomery, an institution named in honor of his mother and owned and operated by him and by his brother, Dr. Robert S. Hill of Montgomery. For more than thirty years these brothers have been associated in the practice of surgery, Dr. Luther Hill doing the general surgery and Dr. Robert Hill the gynecology.

In 1902 Dr. Luther Hill reported the

first successful case, in America, of suture of the heart for a wound penetrating the ventricular cavity, and six years later he published a paper on Wounds of the Heart with a report of three cases. He wrote the section on Wounds of the Heart for the "Reference Handbook of Medical Sciences," of which contribution the publisher said: "We are very glad to report that the article of Dr. L. L. Hill, of Montgomery, Alabama, in the Third Edition was so highly thought of and received such favorable comment and is so nearly down to date at this time that it has been copied intact into the Fourth Edition of the Handbook." Dr. Hill is also author of many other notable contributions to surgical literature. He has been a student all his life and possesses one of the finest medical libraries in the country, as well as many volumes of general literature. It is an exceptional evening that Dr. Hill is not to be found in his library studying and reading until one or two o'clock in the morning. Suffering since his early manhood from otosclerosis with its ever increasing handicap, Dr. Hill has been denied much of the pleasure that comes from the contact and society of his contemporaries in the meetings of medical associations. The versatility of his knowledge, the wide range of his information and his ever ready and unfailing memory have, however, been the source of much admiration and delight to his friends. In his library with his friends or with his pen the warmth of his nature finds true enjoyment. He has written many letters to his friends on many subjects as diverse as comments on the opossum and a review of Papini's "Life of Christ."

In 1910, the University of Alabama, in recognition of Dr. Hill's achievements as a surgeon, conferred upon him the degree of Doctor of Laws. In 1913 he was elected a fellow of the American College of Surgeons and in 1925 he was given the Phi Beta Kappa key by Alpha Chapter of the University of Alabama. Dr. Hill is a Democrat and is a member of the Sigma Nu Fraternity.

On July 12, 1888, Dr. Hill married Miss Lillie Lyons of Mobile, Alabama. They are the parents of four children: Mrs. Lillian Hill Rucker of Birmingham, Alabama, the wife of Dr. E. W. Rucker, an ear, nose and throat specialist of that city; Hon. Lister Hill, of Montgomery, Alabama; Miss Amelie Hill of Montgomery, Alabama, and L. L. Hill, Jr., of Des Moines, Iowa. Hon. Lister Hill was named by his father for Sir Joseph Lister and at the early age of twenty-eight years was elected to Congress where he still holds his seat. L. L. Hill, Jr. was graduated from the United States Military Academy at West Point in 1918.

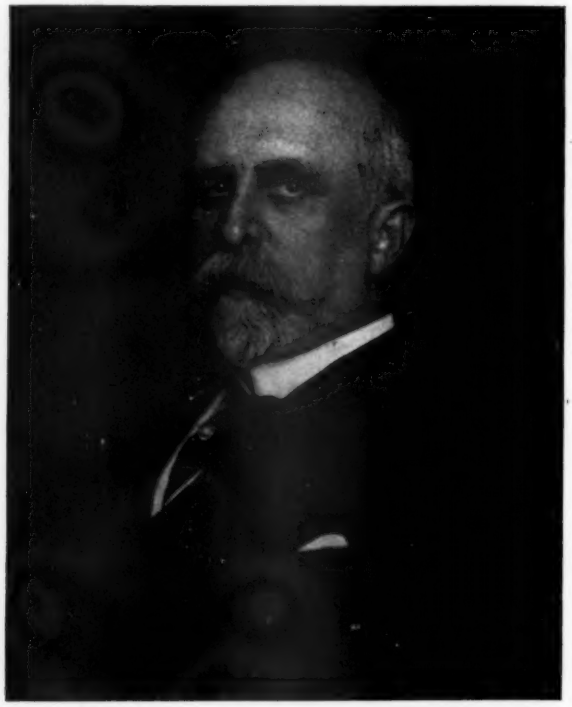
Hubert A. Royster.

VIRGIL PENDLETON GIBNEY, M.D., LL.D.

VIRGIL P. GIBNEY, one of the pioneers of orthopedic surgery in America, and for nearly two generations its most distinguished representative, died on June 16, 1927.

Dr. Gibney was born in Jessamine County, Kentucky, on September 29, 1847; and had he lived three months longer, he would have completed his eightieth year. He received his early education in the south, being graduated with the degree of Bachelor of Arts, from the University of Kentucky in 1869 (A.M. in 1872). He then came to New York and entered the Bellevue Hospital Medical School from which he was graduated in 1871. Soon after, he became associated with the Hospital for the Ruptured and Crippled, as Assistant Resident Surgeon. This was in the early days of the institution, for it was founded in 1863 and had only recently moved from a house on Second Avenue to its new home on the corner of Lexington Avenue and Forty-second Street. It was the only hospital in the country for the treatment of crippled children and for hernia. On the death of Dr. James Knight, in 1887, Dr. Gibney was appointed Surgeon

in Chief of the Hospital for the Ruptured and Crippled; and from that time until his retirement three years ago, he continued not only to direct the medical and surgical departments of the hospital but to render invaluable help in its administration. It is given to few men to serve the same hospital for an uninterrupted period of fifty-three years, and fewer still have been able to render any institution such invaluable service.



Virgil Pendleton Gibney, M.D., LL.D. (1847–1927).

During the fifteen years from 1872 to 1887, Dr. Gibney was busily engaged in a clinical study of the great variety of bone and joint diseases and in correcting deformities resulting therefrom. He was one of the first to appreciate the very great value of plaster of Paris bandages in the treatment of orthopedic conditions, and he became remarkably skillful in applying them. Furthermore, he had a natural mechanical bent which was of the greatest aid in his work, and he devised many new appliances as well as improvements on older ones. During this period he wrote little, at least for publication, but early formed the habit of making careful histories of all the patients who came under his care. In later years when he began to publish contributions on orthopedic subjects, he was able to draw upon a vast amount of clinical material, and his papers always carried great weight because they were based upon facts gathered from personal observation rather than upon theories, however brilliantly conceived or ably presented.

Up to the time of his appointment as Surgeon in Chief of the Hospital for the Ruptured and Crippled, I can find but ten papers that he published in various medical journals. His first paper, in 1877, reported the death of two children from chloroform anesthesia. In the year following he brought out a paper on The Paralyses of Pott's Disease, Being a Clinical Study of Fifty-eight Cases. His paper on Perityphilitis in Children; Illustrating Points in the Differential Diagnosis of Hip Disease was published in 1881. From 1887 to 1890, a period of four years, he published fourteen papers. Among the more important

ones may be mentioned: Operative Procedures in the Bone Diseases of Childhood (1890) and Present Status of Congenital Dislocation of the Hip and the Bloodless Reduction (1903). His published papers numbered more than one hundred. They were of the utmost help to the general practitioner, all being very practical and all marked by brevity and lucidity.

Although Dr. Gibney began his surgical career in the pre-antiseptic era, he early recognized the great advantage of Lister's methods. Prior to 1887 the treatment of both orthopedic and hernia cases at the Hospital for the Ruptured and Crippled consisted almost solely in mechanical appliances. Dr. Gibney was quick to recognize that surgery had a distinct place in the treatment of these conditions, and that many cases theretofore treated by mechanical appliances would show better and more prompt results from operative treatment or a combination of surgical and mechanical methods.

Dr. Gibney was Professor of Orthopedic Surgery at the New York Polyclinic Medical School and Hospital from 1882 to 1894, when he resigned to accept the chair of Professor of Orthopedic Surgery at the College of Physicians and Surgeons, Columbia University, which he held until 1917. He was one of the founders and first President of the American Orthopedic Association, and was Vice President of the New York Academy of Medicine from 1902 to 1904. In 1899 the honorary degree of LL.D. was conferred upon him by his Alma Mater, the University of Kentucky.

He was a member of the Southern Society and of the Century and University Clubs.

In October, 1883, he married Miss Chapin of Springfield, by which marriage he had one son, Robert A. Gibney. In January, 1893, several years after the death of his first wife, he married Miss Julia Truby of Bridgeport, Connecticut, by which marriage he had two daughters, Miss Susan Gibney and Mrs. Henry Patterson.

Dr. Gibney was highly fitted by nature for an orthopedic surgeon. He possessed unusual mechanical skill, and that degree of patience that can wait years for the results of treatment, so necessary in dealing with crippled children. He was, moreover, an indefatigable worker, and blessed with a physical endowment that never tired. He had a remarkable power or influence over his patients. They all worshipped him and waited early for his daily morning rounds, when his wonderful smile drove away their aches and pains and was often a greater factor in hastening their recovery than was surgical operation or mechanical appliance. Generations of house surgeons came and went and every one left with a feeling of great respect for Dr. Gibney's professional skill, and with a stronger feeling of friendship and affection that endured through all the years. In October, 1922, a banquet in honor of his fifty years of service at the Hospital for the Ruptured and Crippled was tendered him at the Hotel Commodore by more than four hundred of his colleagues, friends and admirers, many of whom came from distant parts of the country.

I cannot close this brief memoir without a personal note. I first met Dr. Gibney when House Surgeon at the New York Hospital, and from October, 1890, when I received an appointment in the Hernia Department of the Hospital for the Ruptured and Crippled, I came in almost daily contact with him. During this long period of more than thirty-five years, I came to know him well and to recognize the sterling qualities of his rare personality. Among these qualities one stands out above all others—the spirit of helpfulness and encouragement that he ever showed toward the younger men. He will be remembered long as a distinguished surgeon and a great teacher, but even longer as a loyal and devoted friend.—William B. Coley.

BOOK REVIEWS

LISTER AS I KNEW HIM. By John Rudd Leeson, M.D. N. Y. William Wood & Co., 1927.

There have been two such excellent biographies of Lister published already that there would hardly seem room for a third. Dr. Leeson's book, however, fills a gap which is wanting in those of Godlee and Wrench. Leeson was a student and dresser in Lister's ward in Edinburgh at a crucial time in the history of his work and this intimate personal record is an invaluable story of the change in hospital conditions brought about by Lister's discovery. In 1871 Leeson had worked in St. Thomas' Hospital, London, in a new building, on a well-chosen site, and staffed with nurses trained by Miss Nightingale. It was supposed that here at last was a model hospital in which the septic diseases that decimated the wards in other hospitals would no longer prevail. Unfortunately the spectre of death marched through the new wards and patients died of pyemia, septicemia and hospital gangrene in the same proportion as they did in the old institutions. Dr. Leeson gives some of the reasons—the old dirty frock coat worn by the operator after having seen long service in the dissecting room; the "ward sponge" used in dressing one case after another and supposedly cleansed by wringing it out in a bucket of water between the dressings, and the filthy instruments kept in plush-lined cases. He describes the change in ward conditions which he witnessed when he left St. Thomas' to go to Lister's ward at Edinburgh. Although the ward was old and dark, the patients seemed cheerful and comfortable. The temperature charts at the head of the beds showed almost even lines of dots instead of the terrible jumps with which he was familiar on the charts of the septic patients at St. Thomas'. There was no odor except that of the carbolic acid so freely used by the great innovator who had wrought the change. Leeson gives an excellent account of the methods employed by Lister when he as his dresser took part in carrying them out. His description of the care with which Lister provided for the comfort of his patient, applying the dressings and splints himself, accompanying him back to the ward from the operating room in order to see that he was properly lifted from the stretcher and placed in bed, and the cheerful words of encouragement with which he maintained his morale is well worth reading and taking to heart by surgeons of today. He throws a curious light on the relations, or lack of them, existing between Lister and his colleagues. The latter never visited his ward or showed the slightest interest in his work, nor did they ever ask him in consultation. Some of the junior surgeons, notably Miller, Bishop and Chienne, were won over at an early day and became enthusiastic advocates of the antiseptic method. Lister was a grave, formal man but his innate goodness of heart and genuine amiability are brought forth on every page of this book, as are his greatness as a teacher and inspirer of students and his modesty. He never hesitated to expose the occasional mistakes that he made and therefrom draw valuable lessons for the young men or the foreign surgeons who attended his classes. Dr. Leeson's book is of great practical value to the surgeon who is interested in studying the bridging of the gap which separates pre-antiseptic surgery from that of today. It is a most original and valuable contribution to the history of surgery in the nineteenth century, written at first hand by one who was capable of appreciating the magnitude of the revolution in which he took part. FRANCIS R. PACKARD.

A MANUAL OF GYNECOLOGY. By John Osborn Polak, M.SC., M.D., F.A.C.S., Professor of Obstetrics and Gynecology, Long Island College Hosp., Professor of Obstetrics, Dartmouth Medical School. Ed. 3, 8vo. Cloth. $5. Pp. 402; 145 engr., 12 col. pl. Phila. Lea & Febiger, 1927.

As in earlier editions this useful manual of gynecology emphasizes chiefly diagnosis and pathology and, by the judicious use of italics, stresses important points for the benefit of the student. Without materially increasing the bulk of the volume Polak has added a summary on the glands of internal secretion and has brought the work up to date by including important new literature. We found, however, only a passing reference in the text to the most important contribution that has been made to gynecological diagnosis in this century—Rubin's peruterine insufflation test

for tubal patency; and we could find no reference to it in the Contents or the Index.

The Duodenal Tube and Its Possibilities. By Max Einhorn, M.D., Prof. Med., N. Y. Postgrad. Med. School. Ed. 2. 8vo. $3. Pp. 206; 126 illus. Phila. F. A. Davis Co., 1926.

This elaborated edition includes the history and development of duodenal and intestinal tubage by its pioneer. Successive chapters deal with the tube and its congeners, the duodenal contents, diagnostic import of the tube, its therapeutic uses, and that of other instruments or the pylorous duodenum and small intestines.

Die Leitungsbahnen des Schmerzgefühls und die Chirurgische Behandlung der Schmerzzustände. By Prof. Dr. O. Foerster, Breslau. 8vo. Mk. 19.50. Pp. 360; 104 illus. Berl. Urban & Schwarzenberg, 1927.

This discussion of the pathways of sensory impulses is a careful presentation of old and new data, by a master of German neurological surgery.

In Part I, sensation is traced from the receptor to the brain. Part II is devoted to painful surgical affections of the nerves, root ganglia, nerve roots, cord, brain stem and cerebrum. The final chapter of fifty-five pages deals with headaches of different variety.

There is a splendid discussion of the dermatomes (Head's zones) and their disturbance in visceral disease. Serious students of neurosurgery can ill afford to neglect Foerster's essay.

An index would greatly augment the value of this book.

Birth Injuries of the Central Nervous System. Pt. I. Cerebral Birth Injuries. By Frank R. Ford, Johns Hopkins Hosp. Pt. II. Cord Birth Injuries. By Bronson Crothers and Marian C. Putnam. Harvard Med. School. Med. Monogr. xi. 8vo. Cloth. $4. Pp. 164; illus. Balt. Williams & Wilkins Co., 1927.

This is a sample of the Medicine Monographs of which American Medicine may be proud. For scholarly marshalling of facts they rank with the best English tradition, while for exhautive bibliographic research they are equal to the ideal of pre-war Germán erudition.

Surgeons, obstetricians, pediatrists and practitioners in general, in a distressing predicament, will find in this volume the answer to surging queries. At times it will bring comfort, at other times, remorse, to the attendants at childbirth. Always it can be relied on for knowledge and direction in the prevention of accident and the care of those afflicted.

An important contribution by American medicine to obstetric practice, it should become a textbook in the schools and achieve a place with Kanavel's "Infections of the Hand."

The chapters include pathology, etiology and consequences, somatic and mental. Case reports are appended. An index would make this little volume even more useful.

The International Medical Annual. A Year Book of Treatment and Practitioner's Index. Forty-Fifth Year, 1927. 8vo. Cloth. $6. Pp. 560; illus. N. Y. William Wood & Co., 1927.

An examplar of succint presentation and judicious selection, well printed and illustrated, this compend of annual progress is eagerly welcomed in succeeding editions. Busy practitioners have in these volumes a useful and easily consulted presentation of improvements in technique and change of viewpoint.

Mineral Waters of the United States and American Spas. By William Edward Fitch, M.D., Asst. Gynec., O.P.D., Presbyterian Hosp., N. Y. 8vo. Cloth. $8.50. Pp. 799; illus. Phila. Lea & Febiger, 1927.

This volume is an attempt at a scientific presentation of mineral waters of the United States and American spas. Part I deals with classification, contents, dosage and physiological action. Part II deals with crounotherapy or the use of mineral waters internally. Part III deals with balneotherapy and Part IV contains a list of the mineral springs of the country, arranged by the states alphabetically listed.

The book contains old-fashioned chemical analyses of the waters for their salt content, with much gossipy information about railroads, hotels and "medicinal summaries." Thus, on page 492 "Medicinal Classification is, alkaline Ab, 2; strong saline, 1.3; strong sulphur or (Ab2, +Cl1.3, +S). The analysis shows this to be a very highly mineralized, thermic, sodic, muriated, sulphated and sodic and calcic bicarbonated saline (bromic, ferruginous) water, possessing diuretic, antacid, aperient, tonic and alterative properties," and so on. Of course such statements are extremely helpful

in prescribing. The final chapter tells of the important American spas and has beautiful illustrations of their hotels and equipment.

The reviewer has searched in vain for any discussion of pH or of buffer values in the waters and notes that the author omits all reference to recent epoch-making studies on water balance in the body. He prefers to rely on "clinical experience." Until clinical observations are checked by controls and the conditions of application analysed statistically, spas and mineral waters will have their great and useful place in the practice of medicine, but it will be a check on progress to consider that their application and study has become in the least bit more conditioned by modern science, than was their prescription by Hippocrates of Cos, or the aborigines of our own country.

A really scientific study of a single mineral water is sorely needed.

Transfusion of Blood. By Henry M. Feinblatt, M.D., Asst. Clin. Prof. Med., Long Island College Hosp. Brooklyn, N. Y. 8vo. Cloth. Pp. 137; 24 engr. N. Y. Macmillan Co., 1926.

A succint account of the history and technique of blood transfusion is written with great emphasis upon the author's modification of the Unger instrument.

Basal Metabolism in Health and Disease. By Eugene F. DuBois, M.D., Medical Director, Russell Sage Inst. Path.; Assoc. Prof. Med., Cornell Univ. Med. Coll., N. Y. Ed. 2. 8vo. Cloth, $5. Pp. 431; 92 engr. Phila. Lea & Febiger, 1927.

That DuBois' book has required a second edition in a few years is witness to the importance of basal metabolism to practitioners. It is a tribute to the entertaining and thorough presentation of a pioneer and an authority in this field. The mark has grown with increased knowledge and can be recommended as an expression of the best scientific information and practice.

Only a few years ago the study of basal metabolism seemed a clinical laboratory procedure which only the elect might achieve. Today, surgeons and physicians accept the findings of technicians and employ them in diagnosis with the assurance given to a blood count or a temperature reading.

DuBois presents in Part I, Metabolism in Health, in Part II Metabolism in Disease. Chapters of the latter treat of undernutrition and overnutrition or obesity, diabetes, metabolism in relation to thyroid, adrenal, pituitary and sex glands, disesases of the blood,heart and kidneys, fever, water metabolism, the influence of nerveous system and of drugs. There is an excellent index.

BOOKS RECEIVED

Practical Otology. By Morris Levine, M.D., Assoc. Prof. of Otology & Assoc. Attend. Otologist, N. Y. Post-Grad. Med. School & Hosp. 8vo. Cloth. $5.50. Pp. 387; 145 eng., 3 col. pl. Phila. Lea & Febiger, 1927.

Fundamentals of the Art of Surgery. By John H. Watson, M.B., C.M. (Lond.), F.R.C.S. (Eng.); Surgeon, Victoria Hospital, Burnley. 8vo. Cloth. $6. Pp. 349; 65 illus. N. Y. Paul B. Hoeber, Inc., 1927.

Tropical Surgery and Surgical Pathology. By Karuna K. Chatterju, F.R.C.S.I., Surgeon, Medical College Hosp., Calcutta. 8vo. Cloth. $6. Pp. 224; 91 pl., 5 charts. N. Y. William Wood & Co., 1927.

Les Cancers du Sein. By Pierre Delbet, Prof. de Clinique Chirurgicale, Faculté de Méd. de Par. 8vo. Paper. 50 Fr. Pp. 343; illus. Par. Masson et Cie, 1927.

Diagnostic des Principaux Cancers. By Henri Hartmann, et al. 8vo. Paper. Price, 10 Fr. Pp. 64; 10 figs. Par. Masson et Cie, 1927.

Handbuch der Biologischen Arbeitsmethoden. Ed. by Geh. Med.-Rat. Prof. Dr. Emil Abderhalden, Direktor des Physiologischen Institutes der Universität Halle a.d. Saale. Pt. 5. Methoden zum Studium der Funktionen der einzelnen Organe des tierischen Organismus, Pt. 1, No. 4. 8vo. Paper. Pp. 161. Berlin: Urban & Schwarzenberg, 1927.

Die Chirurgische Behandlung der Gehirntumoren. Eine Klinische Studie. By Dr. Herbert Olivecrona, Privatdozent Oberarzt an der chirurgischen Universitätsklinik in Seraphimerkrankenhaus, Stockholm. In collaboration with Dr. E. Lysholm, Chefarzt der Röntgenabteilung des Krankenhauses Mörby, Stockholm. 8vo. Pp. 344; 288 illus. Berl. Julius Springer, 1927.

Cystoscopy. A Theoretical and Practical Handbook Containing Chapters on Separate Renal Function and Pyelography. By James B. Macalpine, F.R.C.S. (Eng.); Honorary Surgeon and Surgeon in Charge of Genito-Urinary Dept., Salford Royal Hosp., Manchester. 8vo. Cloth. $7. Pp. 284; 181 illus., 12 col. pl. N. Y. William Wood & Co., 1927.

PROGRESS IN SURGERY

Selections from Recent Literature

KATZENELENBOGEN, S., Geneva. Synthalin in the treatment of diabetes. (La synthaline dans le traitment du diabète). *Rev. méd. de la Suisse Rom.* April 25, 1927, xlvii, 348.

Following the work of Frank of Breslau, the author has undertaken the clinical study of synthaline. Synthaline is a drug belonging to a group of substances closely allied to hexylenamine guanidine. The exact mode of action is not yet known. It is, however, known that it acts to reduce sugar in blood and urine and to combat acidosis. Approximately 1 mg. of the drug causes the disappearance of 1.2 mg. of sugar in the urine. It may be used in conjunction with insulin. When given alone, it is administered by mouth in coffee, tea or soup. It is well to begin with a dose of about 10 mg. If this proves harmless, the regular treatment is started. Because of the delayed effect and the tendency to cumulative action, the author advises giving the drug in one of the following manners:

1. On each of two days, 20 mg. of the drug are given morning and evening. The third is a rest day. On the fourth day the series is repeated.

2. The first day 20 mg. are given morning and evening, the second day 20 mg. are given in the morning only. The third day 20 mg. are given in the evening only and on the fourth day another 25 mg. are given in the evening. The fifth day is a rest day.

3. Two doses are given on the morning and evening of the first day. The second day 20 mg. are given in the morning, the third day 20 mg. are given morning and evening and the fourth day is a rest day.

In this manner, the amount of drug given is varied to meet the conditions. The drug may produce severe secondary reactions, such as anuria, various gastrointestinal upsets etc. These secondary reactions cease immediately upon withholding the drug. The exhibition of atropine may markedly reduce tendency to dyspepsia and calcium carbonate may aid in reducing the ill effects upon the vegetative nervous system.

The author comes to the conclusions that synthaline is of value in reducing the blood sugar and in causing a reduction and disappearance of sugar and acetone in the urine. Because of the toxic effects of the drug, it is advised that no more than 120 mg. be given in the course of the first four days. Such doses will cause a reduction of 30 to 40 grains daily. Because of the relatively slow action of the drug, it cannot supplant insulin in cases of diabetic coma but it will prove of distinct value in the milder cases of diabetes where prolonged hypodermic injections can be avoided.

BÉCLÈRE, A. Successful roentgen treatment of a pulsating apparently sarcomatous neoplasm of the sacrum. *Strahlentherapie*, 1926, xxi, 561–566.

The case described, occurring in a girl aged thirteen, is a striking example of the remarkable effects of roentgen therapy on certain neoplasms of the osseous system, especially the spinal column.

Four months previously the child suffered a painful fall upon the buttocks. After this accident increasing painful symptoms developed in the legs and over the sacrum. After a while the original site of trauma developed a pulsating tumor which was painful. A test puncture of the tumor revealed pure blood and no signs of abscess. The roentgenogram of the pelvis showed the iliac bones practically normal and almost complete absence of the shadow of the os sacrum except for one or two shadows remaining in the median line. This indicated that if there was no destruction of this bone there was at least almost complete decalcification.

The various symptoms and the course of the condition led to the diagnosis of a malignant tumor of the os sacrum. In all probability it was a sarcoma belonging to the group of telangiectatic bone sarcomas characterized by a pulsation isochronic with the pulse. A test excision seemed to be contraindicated; likewise any attempts at operative removal of the tumor. Roentgen therapy seemed to be the only recourse and the patient received the following irradiation: 200 kv. (40 cm. spark gap), 3.5 ma., 0.5 mm. Zn plus 2 mm. Al, skin focal distance 30 cm., field of exposure 15 × 15 cm. Four such treatments were given at intervals of 48 hours, the surface received at each treatment a dose of 1000 roentgen units (measured with the Solomon ionometer). Distinct improvement became evident fourteen days after the last

treatment. The patient received another series of four treatments as above administered about a month after the beginning of the first series.

The patient was discharged and when seen again three months after termination of the last treatment all symptoms had disappeared and the girl was as active as ever. The roentgenogram showed reappearance of the os sacrum, somewhat deformed and not quite complete. The menses had appeared once before the occurrence of the accident and have not reappeared since. It is to be feared that these will not return, since the ovaries of necessity had to be included in the zone of irradiation. However, the mammae and pubic hair appear to be developing normally which suggests that the secondary sex characters are developing as if the ovaries, despite interruption of their normal menstrual function, still retained their endocrine activity. There is no justification for calling this a cure in view of the short observation, and the case must be studied further.

MENEES, THOMAS O. Intragastric radium treatment of carcinoma of the stomach. *J. Am. M. Ass.*, June 19, 1926, lxxxvi, 1904–1905.

The application of radium immediately to the growth has definite advantages over external roentgen therapy alone in the treatment of gastric carcinoma. For accurate placing of the radium, both tube and tumor must be visualized. The radium tube in the stomach is readily visible under the roentgenoscope but the tumor is invisible without a contrast medium. With the usual contrast medium the tube is lost in the barium shadow. This suggests the use of air as it will contrast both. The air must be confined, to keep it under control and prevent it from rising to the highest point of the stomach.

To meet these requirements the author employs a rubber balloon cemented to a small rubber tube. The radium on a flexible wire coil is placed inside this and the bulb of a sphygmomanometer is attached to the other end of the tube. This applicator when passed into the stomach and distended gives a clear outline of the radium tube and the carcinomatous filling defect. The spiral wire carrying the radium is attached to the piston of a syringe so that any movement of the piston is transmitted to the radium tube at the other end of the spiral, and the radium can be pushed around and placed at the desired point. It is important to determine the position of the radium in three planes without moving the patient and displacing the radium, hence an arrangement should be made for roentgenoscoping the patient in several planes without the position of the patient being changed.

The radium is lightly filtered (0.5 mm. silver) to obtain the greatest surface effect and to minimize the time of application. The treatment is divided into short sessions of one to three hours daily and continued until all of the accessible surface of the tumor has been covered. Radium cannot be satisfactorily placed in all cases by this method. Where the lumen is much narrowed or tortuous it may be impossible.

Since the majority of gastric cancers are relatively insensitive to radiations, this method is practically only palliative. It is of value in slowing the rate of growth and relieving pain and hemorrhage. Probably, the greatest value is in opening up the narrow portions of the stomach by destruction of the surface of the tumor and preventing an obstruction with its violent train of symptoms. There is also an increased fibrosis of the deeper portions of the tumor with restraint of growth and obliteration of blood vessels. Complete retrogression of the tumor is to be expected only in highly cellular anaplastic growths which are not too extensive. Since the method is practically palliative, it is no competitor of surgery but rather a complement. The pyloric growths accessible to surgery are the most difficult to apply radium to accurately. With the less surgically accessible, cardiac growths it is much easier to place radium.

NOVAK, EMIL. The treatment of functional uterine hemorrhage. *J. Am. M. Ass.*, April 10, 1926, lxxxvi, 1105–1107.

The methods of treatment of functional ("idiopathic" or "essential") uterine hemorrhage include organotherapy, repeated curettage in recurrent cases in young women, radiotherapy, especially in patients at the menopausal age, and hysterectomy at menopause under certain conditions. A certain number of mild cases appear to correct themselves spontaneously.

It is essential that no other diagnosis should be entertained in such cases until the possibility of malignancy has been excluded and for this reason the diagnostic curettage is necessary. In no other way can the nature of the trouble be established. Especially distinctive is the finding of hyperplasia of the endometrium. Only by diagnostic curettage can one exclude the existence of adenocarcinoma of the corpus. In most cases curettage will be followed by relief from the hemorrhage and in many cases this relief will be permanent.

In women who have lived their reproductive lives and in whom the matter of further child bearing need not be considered or at any rate is distinctly subordinate to that of health, the

indication is clear for radiotherapy. This is the almost ideal indication for radium in gynecology, for menstruation can be checked promptly and with certainty. In uncomplicated cases there would seem to be no reason for hysterectomy where radiotherapy is available. In cases, however, in which there is some associated lesion indicating laparotomy, hysterectomy is a perfectly justifiable and effective procedure so far as correction of the bleeding is concerned.

Scott, Arthur C., Jr. Cauterization and cautery excision of cancer. *J. Am. M. Ass.*, Oct. 9, 1926, lxxxvii, 1188–1193.

The theory of cauterization is sound except that its practice results in mass destruction of tissues, and the quantity of radiated heat applied at every point where it may be needed is an uncertain element. Although this heat is measurable, in actual practice it is not measured in every case. The method of choice in cauterization at the present time is to use the cautery at a white heat whenever the situation of the tumor will permit. This cannot always be done, however, in certain situations around the eye and in other regions. Cosmetic considerations are coming to be considered less and less where malignant growths are involved.

Freedom from local recurrence for a period of three years should be the criterion of the effectiveness of a particular method of local treatment for surface and readily accessible subsurface malignant growths. On this basis, the cautery excision operation and the cautery gland dissection are found more efficacious than the direct cautery operation. Either of the cautery methods is superior to the knife operation or other local methods of treatment of superficial cancers. The curability of surface and readily accessible subsurface malignant growths has been substantially increased by the cautery excision and cautery gland dissection operations.

Of 1000 cases studied since 1906, nineteen of the cases had to be discarded because of insufficient data. The 981 remaining cases are divided into three main classes: cauterization operation cases, 308; cautery excision operations 482, and cautery gland dissection with excision, 191. The operative mortality in the entire series was 0.4 per cent. There were 469 cases living five years or longer after operation; and 617 three years or longer after operation.

In the group of traced cauterization cases in which operation was done three years or longer previously there were 6.6 per cent with local recurrences. In the cautery excision operations there were 3.5 per cent cases with local recurrences present three years or longer after operation. In the cautery gland dissection group there were 3.7 per cent with local recurrences.

Davis, John Staige. The treatment of deep roentgen-ray burns by excision and tissue shifting. *J. Am. M. Ass.*, May 8, 1926, lxxxvi, 1432–1435.

When a deep roentgen-ray burn occurs and the ordinary local methods have been tried for a reasonable time, nothing is gained by delaying operative work. In fact delay in radical treatment may be dangerous as malignant degeneration is not uncommon in certain types of these burns. In none of the cases referred to the author has treatment with ultraviolet and other radiations been beneficial. Early excision of deep burns with tissue shifting promises more surely than any other method yet devised a reasonable prospect of permanent relief in a comparatively short time. Pain is eliminated and in many instances function is restored, and patients who have been incapacitated for years have been returned to their former activities. The ultimate results have been gratifying.

Excision with tissue shifting is also the procedure of choice in chronic deep radium burns and ultraviolet burns, and promises a quicker and better result than any other method.

In the ideal case the ulcer and the surrounding area of induration should be excised out to and down to healthy tissue. In many instances, however, complete excision is impossible on account of the extent and situation of the burn, but in these cases the excision should be as radical as the circumstances will permit.

When the exposed tissues seem normal and the excision has been complete grafting may occasionally be performed immediately. In the majority of instances following the excision of deep old burns there is a general oozing which it is almost impossible to check. In these cases one must wait until granulations begin before grafting is performed. The type of graft used depends on the location of the lesion.

Graham, Allen. Exophthalmic goiter and toxic adenoma. *J Am. M. Ass.*, Aug. 28, 1926, lxxxvii, 628–631.

It is commonly held that exophthalmic goiter and toxic adenoma are two separate disease entities. There is, however, not a single symptom or sign that can be recognized as necessarily pathognomonic for exophthalmic goiter as opposed to toxic adenoma. There is not a single anatomic or histologic alteration in the thyroid in either the adenomatous or the non-adenomatous portion of the gland that is

necessarily pathognomonic for exophthalmic goiter as opposed to toxic adenoma.

There are equally good reasons for speaking of dysthyroidism in both these diseases. The degree of hypertrophy and hyperplasia of the thyroid determines the quantity of iodine that will be tolerated without untoward effects in both exophthalmic goiter and toxic adenoma. In both of these the reaction to iodine is fundamentally the same.

There therefore remains no alternative but to regard exophthalmic goiter and toxic adenoma as clinical variations of a single morbid state.

Rucker, M. Pierce, Richmond, Va. Pneumonia as a sequel to anesthesia. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 764.

A study of the literature, some of which is quoted, seems to indicate that the term "ether pneumonia" is a misnomer. In fact anesthesia probably plays a minor rôle in the causation of postoperative lung complications except that it permits extensive operative procedures upon septic and debilitated patients. After due allowance is made for aspiration of septic material, the lighting up of a preexisting process in the lungs, the chilling of the patient on the table and before he recovers consciousness, there remain a considerable number of pneumonias and pleurisies that are best explained by septic material from the operative field lodging in immobilized lung tissue.

Flagg, Paluel J., New York. Intratracheal inhalation. Preliminary report of a simplified method of intratracheal anesthesia developed under the supervision of Dr. Chevalier Jackson. *Arch. Otolaryngol.*, May, 1927, v, 394.

This safe, improved and simplified intratracheal method for general anesthesia is offered for all operations about the head and neck. The method provides a dry, quiet, odorless field of operation, with increased safety to the patient.

The safety of an indwelling tracheal tube with a lumen sufficient to meet respiratory needs may be considered as satisfactorily solved. The size of tube for a man is 38 F; that for a woman is between 32 F. and 34 F.

Flagg has proved the safety and efficiency of a simple intratracheal method for anesthesia. The disadvantages of the method are: the necessity of intubation by direct vision and the presence of the intratracheal tube in the mouth.

The following advantages are enumerated:

(*a*) Elimination of complicated motor-driven apparatus, manometers and devices for warming and heating the vapor; an operating field free from escaping insufflated vapor; an operative field free from anesthetic; normal respiratory rhythm and amplitude; conservation of carbon dioxide; exclusion of foreign matter such as, blood and vomitus, and ability to maintain the lightest anesthesia.

(*b*) Complete control of artificial respiration by the simplest methods.

(*c*) A technique which makes available the maintenance of anesthesia by ether, gas and oxygen, ethylene or any combination of these agents.

(*d*) Protection from external pressure on the trachea.

(*e*) A method for operations on the nose and throat which gives a field resembling that offered with the use of chloroform, with the safety of a light ether anesthesia, and protection against the aspiration of blood.

(*f*) A field of practical asepsis for plastic operations on the face.

Rosenblatt, Millard S., Detroit. Traumatic cyanosis—its pathological physiology. *Ann. Surg.*, June, 1927, lxxxv, 801.

A case of traumatic asphyxia with recovery is reported.

The prognosis is good if the trauma is not fatal shortly after its occurrence.

The cyanosis of the head, face and neck, with subconjunctival hemorrhages is characteristic of the condition. The distribution of the cyanosis is probably due to incompetent or absent valves of the region, allowing back pressure produced by compression of the superior vena cava to cause a distention of, or a paralysis and a stasis in, the small vessels.

Vaquez, H. and Yacoel, J. Non-diabetic stenosing arteritis. (Artérites sténosantes non diabétique). *Presse mèd.*, May 18, 1927, No. 40, 625.

The authors review the field of arteritis and classify arteritis as being due to trauma, infections, diabetes, trophic disturbances atheromatous changes. The so-called thromboangiitis obliterans is placed by them in a separate category of non-specific chronic obliterating endarteritis of juvenile type. So-called Buerger's disease is to be looked upon not as a separate disease entity but merely as the acute stage of

the disease previously described by others. In the chronic stage of the disease, the symptoms of intermittent claudication and gangrene are seen. Being guided by the results obtained by other writers in the treatment of coronary arteritis and of varicose ulcers, the authors attempted the insulin treatment of these types of juvenile non-diabetic obliterating endarteritis. Four cases are reported. All showed marked improvement in symptoms and one even showed a reestablishment of the pulsations as determined by the oscillometer. The insulin is given in 15 unit to 20 unit doses daily over a period of about twenty days. After a rest of about ten days, a second and if necessary other series of treatments are given. The authors refer to the excellent results obtained by Phillips and Tunick by means of roentgen ray applied to the spine.

Perman, Einar, Stockholm. On circulatory conditions in arterial embolism of the lower extremities. *Acta chir. Scandinav.*, May 25, 1927, lxi, 441.

A certain distribution of symptoms of disturbed circulation does not correspond to a definite localization of an embolus. The clinical picture may vary considerably in different cases for the same localisation of the embolus. In many cases these variations are accounted for by different development of the collateral circulation. This is particularly the case where there is no secondary thrombosis.

On the proximal part of the thigh there are powerful communications between the internal iliac and the deep femoral arteries. On the distal part of the thigh there are connections between the latter arterial system and the superficial femoral group of arteries. In obstruction of the popliteal artery there are possibilities of collateral circulation partly in the arterial system of the knee-joint, partly in that of the calf-muscles, on account of the anastomotic branches existing between the sural arteries and branches from the posterior tibial artery. All these anastomotic communications and their great importance for the collateral circulation are easily demonstrated radiologically. Anatomical investigations have proved these vessels to be macroscopic and easily visible in the adult and sometimes of great size.

The author relates two cases operated upon. In one of them, a woman eight months pregnant with an embolus at the aortic bifurcation, an attempt to reestablish the circulation did not meet with success. In the second case where the embolus was situated at the division of the femoral artery the circulation was reestablished.

Cannon, A. Benson, and Lowenfish, F. Philip, New York. Varicose ulcers of the leg. Treatment with thrombosis and gelatin cast bandages. *Arch. Dermat. u. Syph.*, June, 1927, xv, 647.

The treatment of varicose ulcers of the leg by means of thrombosing the veins with a solution of sodium salicylate, and the application of Unna's zinc gelatine glue bandages was very beneficial in a group of 82 patients. Thirty-four, or 41 per cent, have been discharged as cured. In 18 of the discharged patients the veins were thrombosed and the cast was applied, while in 16 the cast alone was applied. This showed that the percentage of cures with the veins thrombosed and the cast applied about equaled that of cures when the cast alone had been applied. In those patients remaining under treatment the ulcers show from slight to marked improvement.

Rand, Carl W., Los Angeles. Chronic subdural hematoma. Report of seven cases. *Arch. Surg.*, June, 1927, xiv, 1136.

Cases of chronic subdural hematoma are more frequent than has commonly been supposed. The relatively long period that may elapse from the initial trauma until the development of pressure symptoms frequently leads to overlooking of the injury as a causative factor. While the trauma may be insignificant, this is not always the case. The importance of possible preceding trauma in all cases of obscure increasing intracranial pressure should be emphasized.

All cases of chronic subdural hematoma in this series showed a decidedly high pitched percussion note over the calvarium. The note does not appear to be higher on the side of the hematoma.

The results of the spinal fluid examination vary, depending on the interval which has elapsed since injury. Practically all cases, regardless of time, show some increase in spinal fluid pressure. The color at first is usually "smoky" or blood-tinged, later becoming yellow, straw-colored or perfectly colorless. Instances of each condition have been encountered in this series. There may be an increase in cell count and globulin content of the fluid—or both may be normal. Choked disk is usually

present and is frequently more advanced on the side of the hematoma.

Chronic subdural hematoma may occur from childhood to old age. The origin of the hemorrhage in certain instances seems to be from the pial veins or venous radicals of the longitudinal sinus.

While an osteoplastic flap and removal of the hematoma—both linings and contents, as suggested by Putnam—may be the method of choice, it is not unlikely that any operative procedure such as decompression, with evacuation of, or simple trephining and aspiration of the contents of the hematoma, will yield good results. The principle thing after all is to empty the hematoma. It seldom, if ever, refills, although the fate of the lining membrane is an open question.

Brickner, Walter M., New York, Brachial plexus pressure by the normal first rib. *Ann. Surg.*, June, 1927, lxxxv, 858.

There are cases of pain in the arm, with paresthesias and other phenomena, that are relieved by elevating the shoulder and by exercising the trapezius to keep it elevated. These cases, of which three are reported, are probably due to dragging of the brachial plexus over the first rib.

There are more severe cases in which all the phenomena of pressure by a cervical rib are produced by the pressure of an abnormal or even a normal first thoracic rib. Several have been cured by resection of the first rib. The technique of the operation is described.

When operating upon a case of cervical rib it is important to observe whether the pressure to be relieved is due to this supernumerary, or to the normal first, rib.

Two cases are reported of intermittent severe pain and edema in one upper extremity, occurring in adolescent females and perhaps due to plexus pressure by the first rib.

Adson, Alfred W., and Coffey, Jay R., Rochester, Minn. Cervical rib. A method of anterior approach for relief of symptoms by division of the scalenus anticus. *Ann. Surg.*, June, 1927, lxxxv, 839.

In the transcervical or the postbrachial approach, the surgeon is usually content with elevating the brachial plexus and removing the rib, or as much of it as is possible, from behind, without exposing the scalenus anticus muscle, the subclavian artery, or other tissues in front. Because of the occasional postoperative palsy which ensued and the greater ease in operation, Adson was persuaded to adopt the anterior approach, in which the clavicular attachment of the sternocleidomastoid muscle is reflected to expose the scalenus anticus muscle, the subclavian artery, and the brachial plexus. One can readily observe the pressure produced by the scalenus anticus muscle when the neck is extended backward or the head is rotated toward the affected side.

After having removed several ribs according to this technique, and having studied the mechanics which produce the symptoms, the authors were convinced that, with the exception of one case referred to, removal of the cervical rib was really unnecessary, inasmuch as the subclavian artery and the brachial plexus were immediately relieved from pressure and irritation upon severance of the scalenus anticus muscle from its insertion. The latter procedure was much less difficult and more effective since the subclavian artery was then permitted to recede and take on its normal size, provided operative treatment was instituted before any permanent change had taken place. All traction on the brachial plexus is removed by the tenotomy of the scalenus anticus muscle.

The ulnar nerve rides over a bony prominence where it is constantly subjected to motion without symptoms being provoked; there should be no more likelihood of symptoms arising in the brachial plexus when it merely lies on the cervical rib, with little or no motion and no traction on it. Accordingly, the authors have operated on four patients by means of the anterior approach, dividing the tendinous attachment of the scalenus anticus muscle without removing the cervical rib; symptoms were completely relieved.

Colt, G. H., Aberdeen. The surgical treatment of the "de-gloved" hand. *Brit. J. Surg.*, April, 1927, xiv, 560.

The author reports two cases in which the skin of the hand and fingers was torn away leaving functioning fingers behind. In the majority of cases, these fingers become stiff as a result of adhesions and ultimately come to amputation. The cases here reported were restored to a considerable degree of usefulness by the procedure which the author describes. Essentially this consists merely in the making of pedicle flap grafts from the thigh or abdomen.

But the author discusses in detail the manner in which the size of the grafts is to be estimated as well as other technical details looking to the favorable outcome of the treatment. He suggests for this injury and its operative treatment the term "cheiro-dactylo-dermaplasty."

Balfour, Donald C., and Hargis, Estes H., Rochester, Minn. Cancer of the stomach. *Am. J. M. Sc.*, June, 1927, clxxiii, 773.

A series of 1000 cases of cancer of the stomach forms the basis of a review of the general problem of this disease. Change in gastric acidity and symptoms of obstruction are inconstant in the early course. The roentgen ray provides an almost infallible method of diagnosis and should always be used.

Unless there is clear evidence of metastasis, operation is justifiable. Exploration at least was undertaken in more than half the series, and in almost half of these the growth was removed. Obesity, anemia, rapid loss of weight and youthfulness of the patient add to the risk of operation and diminish the prospect of cure.

The liberal administration of food and fluids combined with rest in bed, and the intravenous use of sodium chloride and glucose before operation tend to minimize the risks and enhance the prospects of a good result.

Regional anesthesia will suffice for incision and exploration, but general anesthesia is necessary for a difficult resection, especially if the patient is apprehensive.

The types of resection are discussed and preference given to gastrojejunal anastomosis, which should be carried out in the anterior position when the gastric stump is small. The latter operation should be combined with jejunostomy. No food is given for several days after operation, and fluids are administered extraorally. Lavage of the stomach is desirable, even as a routine on the first day.

The operative mortality is much improved by the preoperative care and by cooperation with the physician. To illustrate this fact reference is made to a series of 46 consecutive cases of partial gastrectomy for cancer of the stomach with death in 1, and to the entire series in 1926, in which death occurred in 8 of 120 cases of partial gastrectomy for cancer.

The end-results in the series of 1000 cases are discussed: If the lymph nodes were not involved 52 per cent of the patients were alive at the end of three years, otherwise only 19 per cent of them survived that long.

Bolton, Charles and Salmond, R. W. A., England. Antiperistalsis of the duodenum and its relation to pyloric regurgitation. *Lancet*, June 11, 1927, ccxii, 1230.

Bolton says that antiperistalsis is a normal movement of the duodenum. Its effects are to delay the food in the duodenum, to ensure its admixture with the digestive juices, and to produce conditions favorable to regurgitation into the stomach.

The duodenal cap is filled periodically from the duodenum, the pyloric sphincter preventing regurgitation into the stomach.

In addition to its function of regulating the output from the stomach the pyloric sphincter prevents regurgitation from the duodenum in the early stages of digestion; as digestion proceeds it commences to relax independently of gastric peristalsis, promotes regurgitation, and thus regulates the acidity of the gastric contents.

An actual swing back of food from the second part of the duodenum is not always necessary to produce regurgitation, since a full cap with a momentary relaxation of the pylorus will produce it.

Shaine, Marks S., New York. The treatment of chronic constipation. *Am. J. M. Sc.*, June, 1927, clxxiii, 814.

A method is advocated for the treatment of chronic spastic constipation by dilatation of the lower intestinal tract with a sigmoidoscope and rectal tube.

In more than 100 cases it has proved successful in all but 2 or 3 cases, where it was impossible to introduce the sigmoidoscope the necessary distance.

This treatment is advocated only in cases where treatment by diet, by mineral oil and by oil injections has proven ineffective. A roentgen-ray examination must be made to exclude organic obstruction.

Barrows, David Nye, New York. Primary carcinoma of fallopian tube, with report of three cases. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 710.

Though the age incidence of carcinoma of the fallopian tubes is largely between forty and fifty, we must watch for it in adults. Grossly,

it frequently cannot be differentiated from chronic inflammatory lesions if removed intact. Radical extirpation, including all near-by palpable lymph glands, is the procedure recommended by most writers. The frequency of this growth requires our attention in all cases of apparently inflammatory pelvic disease. The diagnosis is usually established only by histologic examination. Incomplete removal of the pelvic contents is not a satisfactory method of treatment.

HURD, RALPH A., New York. Results of operations for retroversion. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 742.

The observations made in the course of this study may be summarized as follows:

1. Retroversion as seen and treated at the Woman's Hospital is most often complicated by an accompanying inflammation of the cervix or adnexa with resulting peritoneal adhesions which restrict or even completely inhibit the mobility of the corpus.

2. In very few or no instances can the operator be accused of unwarranted surgery in this group of cases. Even in the patients whose uteri were freely movable, a definite complaint was present, and in over 90 per cent of these distinct improvement followed correction of the malposition.

3. The percentage of all retroversions which produce symptoms cannot be determined from a group such as this, for all these women, except possibly a few who came for sterility, presented definite complaints before operation.

4. Abdominal pain of various types and degrees appears to be a more constant symptom in retroversion than the time-honored backache, although the latter also appears in a large proportion of cases.

5. Retroversion, more than almost any other gynecologic lesion, is an affection of the childbearing period.

6. Only 4 per cent of a large series of patients with retroversion complained of sterility, and more than half of these had also inflammation of the adnexa. Pregnancy followed operation, roughly, once in 4 cases.

7. The series shows 96 per cent of anatomic cures throughout the period of observation, which averaged twenty months, speaking well for the present-day method of handling this condition.

8. There appears but little to choose between the several varieties of round ligament suspension as far as mechanical end-results are concerned. Of the operations frequently done, Bissell's yielded the lowest and Gilliam's the highest percentage of recurrences.

9. The plication of the uterosacrals alone was distinctly unsuccessful in the few such cases done, although they are probably valuable adjuncts in other suspension methods.

10. End-results of retroversion operations considered symptomatically, appear to depend largely upon the symptoms which the lesion produces. One may expect a higher proportion of cures when the patient enters for pain, backache, or other discomfort than when she applies for relief of sterility or some disorder of menstruation.

11. That the reconstructed supporting ligaments of the uterus can undergo evolution during pregnancy is demonstrated by the paucity of spontaneous abortions in women who have undergone operation.

12. A full-term pregnancy was followed by a recurrence of retroversion in a previously-suspended uterus, roughly, but once in seven cases.

CHARLTON, H. R., Bronxville, N. Y. Prevention of carcinoma of the cervix. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 755.

In most cases applying for diagnosis and treatment, the presence of leucorrhea means cervicitis of greater or lesser degree. At any period of life, in all social states, it is the most common disease brought to the attention of the gynecologist, and constitutes the main pelvic reason for leading women to consult physicians. It constitutes the classic example of a predisposing cause for a malignancy which is a very scourge to women. Chronic cervicitis may regularly precede cervical carcinoma. It is a curable or removable disease. Let every chronically infected cervix be approached, not as a cervical catarrh, not as an hypertrophy, not as a laceration, but as the prologue of an epithelial drama whose curtain may be a malignant death.

FRAENKEL, L., Breslau. The principles of the treatment of genital prolapse. The technic of ventrofixation of the vagina. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 757.

In the surgical cure of genital prolapse, the suspension operations may be considered the best principle but, Fraenkel says, the vagina

and not the uterus should be suspended, even if a total prolapse of the uterus should be coexisting.

Technique: The uterus is pulled upwards and outward; transverse incision 2 cm. to 3 cm. long in the vesicouterine fold; separation of bladder downward beyond the vaginal fornix. A suture armed with needles at both ends is now inserted through each half of the vaginal vault to right and to left. Each end is carried forward through (1) the visceral peritoneum (2) the parietal peritoneum, (3) the external oblique muscle, (4) the abdominal fascia, and (5) the skin. The ends are then securely tied over a small gauze pad, so that the anterior vaginal vault is in broad and firm contact with the abdominal wall. The vesicouterine pouch is closed. The abdominal wall is sutured in four layers. The duration of the operation is twenty minutes. It does not matter whether the suture enters the lumen of the vagina or only penetrates the vaginal wall. The suture should be nonabsorbable and is removed on the fourteenth day, after a fibrous scar has formed in the suture canal.

The following objections may be made to this procedure: (1) The vagina is forced directly upward to the anterior abdominal wall; it separates the bladder in two and prevents distention and filling in the median line. The disadvantage is transitory. About 25 per cent of the patients complain of ischuria or strangury following the operation. The symptoms invariably disappear within a few days spontaneously and, after application of a permanent catheter, immediately. Thereafter the capacity of the bladder is not lessened, because the lateral parts expand. Permanent difficulties have never been seen. (2) The vagina is fixed. This might interfere with (a) cohabitation, or (b) labor. The former does not occur. Labor after ventrofixation of the vagina has not been seen, as only patients beyond the childbearing period were subjected to the operation. Labor complications may be prevented by sterilization or confining the procedure to women past the childbearing period. Fraenkel's operation has been performed many times during the last ten years without a single recurrence.

Christian, S. L., and Palmer, L. A., New York. An apparent recovery from multiple sarcomata. *Mil. Surgeon*, July, 1927, lxi, 42.

The authors record what appears to be a remarkable case. A man aged thirty-one years developed a myelosarcoma of the tibia near the site of a chronic osteomyelitis that had been operated upon twice and which, in turn, appears to have developed from a trauma. A few months after amputation of the thigh there appeared a subcutaneous metastasis above the umbilicus and recurrence in the femur and soft parts of the stump, which increased greatly in size. Both of these conditions progressed steadily during treatment by injections of Coley's fluid and metastatic growths appeared in many parts of the body including the right clavicle, the scalp and cranial bones. Under a further course of treatment by Coley's mixed toxins, increasing to 17 minims every day, there was progressive and complete disappearance of all the masses. The metastasis above the umbilicus, which had attained the size of a lemon, yielded to injections directly into it. Fifteen months after the amputation, the man was discharged in good health and apparently completely recovered, and he had gained about 40 pounds in weight. Sections from the tibia and from the supraumbilical metastasis were diagnosed myelosarcoma by Ewing Taylor, and the diagnosis was concurred in by James Ewing and Ernest Codman.

Bird, Clarence E., Boston. Sarcoma complicating Paget's disease of the bone. Report of nine cases, five with pathologic verification. *Arch. Surg.*, June, 1927, xiv, 1187.

The incidence of sarcoma in Paget's disease, so far as it is represented among hospital patients in this country, is approximately one case in ten, a sufficiently high percentage to excite surprise in view of the age of these patients and the fact that bone sarcoma is considered to be a disease of youth.

In elderly people afflicted with sarcoma of bone roentgenograms of the entire skeleton should always be made, for it is probable that the coexistence of the osteitis deformans of Paget is frequently overlooked.

Gillies, H. D. et al. Fractures of the malar-zygomatic compound: with a description of a new *x*-ray position. *Brit. J. Surg.*, April, 1927, xiv, No. 56, 651.

In fractures of the malar-zygomatic compound, the author suggests that a small incision be made in the temporal region, and a heavy blunt elevator be passed down along the fascial planes to beneath the region of the fracture.

By simple leverage, the fragments can in most instances be lifted into place without the necessity of making any unsightly, visible scar.

Simpson, Walter M., Baltimore, and McIntosh, A. Alexander, Montreal. Actinomycosis of the vertebrae (actinomycotic Pott's disease). Report of four cases. *Arch. Surg.*, June, 1927, xiv, 1166.

Actinomycosis is a much more common disease in the United States than a study of the literature would lead one to believe. Actinomycosis of the bone is not so rare as is generally thought.

Four cases of actinomycosis of the vertebrae were encountered in the pathological laboratory of the University of Michigan. All came to autopsy with a clinical diagnosis of tuberculosis of the spine. Two of these occurred within the past year. In two the primary infection was in the lungs; in the other two, the primary focus was apparently in the appendiceal region. The spread of the actinomycotic process to the vertebrae was due to direct extension by man of dissecting sinus tracts and abscesses.

In actinomycosis of the spine, the characteristic lesion is cortical erosion of the vertebrae with vertebral phlegmon, while in tuberculosis the disease causes progressive destruction of the bodies, with collapse and angular deformity. Central destruction of the body of the vertebra, with ultimate collapse and deformity are not found in vertebral actinomycosis. The roentgenogram should easily distinguish the two conditions.

The many other causes of psoas abscesses should be considered before a diagnosis of tuberculosis is made. The development of multiple sinus tracts, with brawny induration of the surrounding tissues, and the persistent absence of the tubercle bacillus should direct one's thoughts to a consideration of actinomycosis.

The pathognomonic "ray fungi" should be looked for by the surgeon who first drains an actinomycotic abscess. Subsequent secondary pyogenic infection renders the search more difficult.

Currettement of the granulation tissue wall of a sinus tract, with histopathologic examination of the fragments, will often establish the diagnosis after frequent examinations of the pus for actinomycetes have proved fruitless. The finding of lipoid cells in the granulation tissue lends support to the probability that the disease is actinomycosis.

Radical surgical excision of all involved tissue offers the best hope of cure, as demonstrated notably by Brickner.

Cleveland, Mather, New York. Hallux valgus. Final results in two hundred operations. *Arch. Surg.*, June, 1927, xiv, 1125.

In this series the most satisfactory operation for correction of hallux valgus was resection of the metatarsal head, together with removal of exostosis. In the selected cases with only moderate hallux valgus and in which the patients complained of painful exostosis and inflamed bursa as the chief source of annoyance, wide excision of the exostoses alone gave satisfactory results. Other operative procedures have not been found as satisfactory. The presence of chronic arthritis in the joint of the great toe predisposes to an unfavorable outcome in direct proportion to its degree of severity. An anterior arch that is severly impaired is a serious handicap in achieving a good result in the operative treatment of hallux valgus. Inadequate excision of the metatarsal and phalangeal exostoses leaves bony spicules which cause subsequent pain. Care should be taken to remove all loose fragments of bone or bone sand. The sesamoids beneath the metatarsal head should be examined as a cause of pain, and removed if necessary. Proper selection of the operative procedure to fit the individual case is of great importance.